

A PICTORIAL SURVEY OF CURRENT PRACTICE, EQUIPMENT AND MATERIALS

Construction Methods

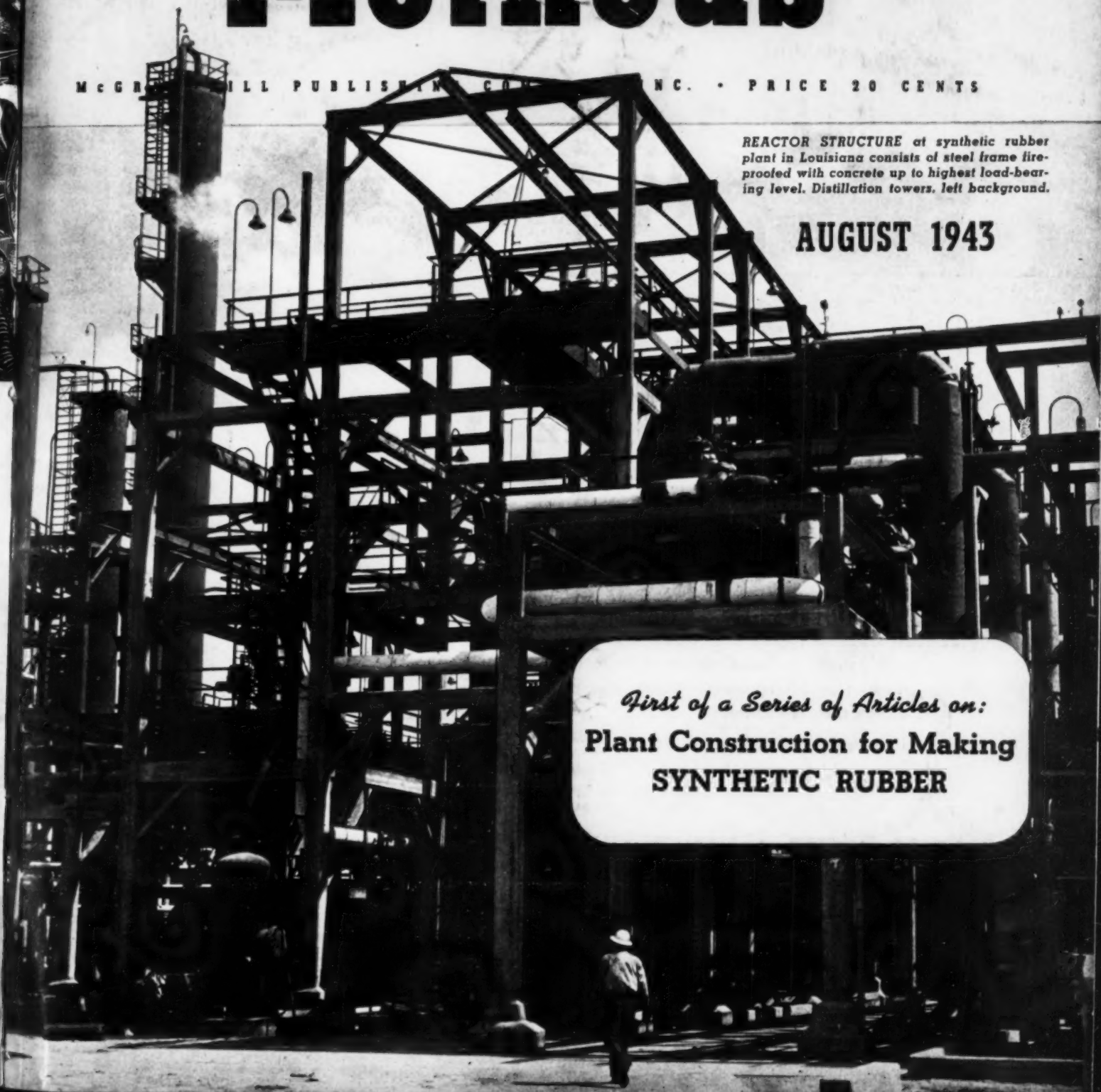
TECHNOLOGY DEPT.

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REACTOR STRUCTURE at synthetic rubber plant in Louisiana consists of steel frame fire-proofed with concrete up to highest load-bearing level. Distillation towers, left background.

AUGUST 1943

First of a Series of Articles on:
**Plant Construction for Making
SYNTHETIC RUBBER**





High strength and workability of Inland Hi-Steel are of great advantage in building heavy field gun and howitzer carriages.



Built Light and Tough with Inland Hi-Steel

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Inland Hi-Steel is ductile, and can be readily cut and formed cold. Its endurance limit is 50% above ordinary steel, and its impact strength at -25°F .

is four and a half times higher. Under proper annealing its yield strength is increased by approximately 40%.

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INLAND STEEL CO.

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CURRENT JOBS

... and Who's Doing Them

BUILDINGS

PUBLIC—Buildings and utilities at Army general hospital in Van Nuys, Calif., will be built by **J&B Construction Co.**, of Los Angeles, for an estimated \$4,000,000. **HRH Construction Corp.**, of New York, was awarded \$2,983,000 contract for dwellings in Pennsylvania. Defense Plant Corp. awarded contract for \$2,750,000 plant in Dorchester County, S. C., to **Daniels Construction Co.**, of Greenville. **Nelson-Pedley, Inc.**, of Philadelphia, Pa., will build 408 two-story dwellings in Philadelphia for \$2,500,000. Two Army contracts for housing in Phelps and Red Willow Counties, Neb., went to **Peter Kiewit Sons Co.**, of Omaha, for an estimated \$2,000,000 each. Another \$2,000,000 Army contract in Dawes County, Neb., went to **C. C. Larsen & Sons**, of Council Bluffs, Iowa, for buildings, and to **Inland Construction Co.**, of Omaha, for outside utilities. **Wm. R. Goss Co.**, of Washington, D. C., received \$1,368,000 contract for housing in Virginia. New Jersey oil refinery unit will be built by **Lummus Co.**, of New York, for \$1,250,000. Army contract for building conversion in Suffolk County, N. Y., went to **Albert A. Lutz Co., Inc.**, of New York, for \$1,000,000-\$1,500,000. **Charles Oehler**, of Galveston, Tex., was awarded \$1,000,000-\$5,000,000 Army housing contract in McCulloch County. U. S. Maritime Commission awarded contract to **Moore & Roberts**, of San Francisco, to build California warehouses for more than \$1,000,000. Army contract in San Bernardino County, Calif., went to **Ford J. Twaits Co.**, of Los Angeles, for more than \$1,000,000. Military installation in Minidoka County, Idaho, will be built by **Brennan & Cahoon**, of Pocatello, for more than \$1,000,000. Washington housing contract went to **Ford J. Twaits Co.**, and **Morrison-Knudsen Co.**, both of Los Angeles, Calif., for approximately \$1,000,000. **J. Emil Anderson & Son**, of Chicago, Ill., was awarded \$1,000,000 contract for construction at Army general hospital in Cook County. **Austin Co.**, of Cleveland, Ohio, will build factory additions in Ohio for an estimated \$1,000,000.

HEAVY CONSTRUCTION

Gas pipeline between Texas and Missouri will be built by **Bechtel Co.**, of San Francisco, Calif.; **O. E. Dempsey Construction Co.**, of Tulsa, Okla.; and **H. C. Price Co.**, of Bartlesville, Okla., for approximately \$9,800,000. **Johnson, Drake & Piper**, of New York, was awarded \$4,000,000 contract for improvements in Essex County, N. J. Submarine drydocks will be built for Navy at Hunters Point, Calif., for \$3,684,000 by **Ben C. Gerwick, Inc.**, of San Francisco. **S. Birch & Sons Construction Co.** and **J. L. McLaughlin**, of Great Falls, Mont., will build \$3,000,000 Army improvements in Cascade County. Army contract for \$2,000,000 for improvements in Oklahoma County, Okla., went to **Chas. M. Dunning Contracting Co.**, of Oklahoma City. Contract for Army Air Force installation in Montgomery County, Ohio, was awarded to **A. Farnell Blair**, of Decatur, Ga., for approximately \$2,000,000.

HIGHWAYS AND BRIDGES

Among recent highway contract awards are the following: Arkansas: \$500,000 to **Hill & Evans**, of Fort Smith, Colorado: \$500,000-\$1,000,000 to **Northwestern Engineering Co.**, of Rapid City, S. D. Florida: \$500,000-\$1,000,000 to **Brinson Construction Co.**, and **J. L. Cone & J. D. Manly**, of Tampa; and under \$500,000 to **Langston Construction Co.**, of Orlando, Louisiana: Under \$400,000 to **Barber Bros. Co.**, of Baton Rouge, New Mexico: \$380,630 to **D. D. Skousen Co.**, of Albuquerque. New York: \$500,000-\$1,000,000 to **Wm. P. McDonald Corp.** and **Good Roads Engineering & Contracting Co., Inc.**, of Flushing; and \$500,000-\$1,000,000 to **Chas. F. Vachris, Inc.**, and **Tufano Contracting Corp.**, of Brooklyn. North Carolina: \$500,000-\$1,000,000 to **Mecklenburg Construction Co., Inc.**, of Durham. Pennsylvania: \$500,810 to **Fred Berlanti & Son, Inc.**, of Harrison, N. Y. Washington: \$1,000,000 to **Myers Bros.**, of Los Angeles, Calif.

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Construction Methods

A Pictorial Survey of Current Practice, Equipment and Materials

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AUGUST, 1943

The HOW of it

For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

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- How **FOUR-ACRE BLACKOUT PLANT** was built of lumber to save 1,920 tons of steel —p. 51
- How **SYNTHETIC RUBBER PLANTS** were rushed to completion by contractors —p. 52
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Management

—Heart of America's Industrial Progress

In Peace and War, Management Men and Methods Steer

Production on a Steady Upward Course

WHEN the Allied armada of 2,000 ships, protected by a vast umbrella of planes, struck the coast of Sicily, Axis leaders once more had reason to wonder how "that decadent, pleasure-loving America" had swung from the manufacture of automobiles, refrigerators and costume jewelry to equipments of war, and had out-produced such mighty plants as the Krupp, the Fiat and the Skoda works—and had done it so quickly.

America at war is in the lead just as it has led a world at peace. Super-performing planes are taking to the air at the present rate of nearly 100,000 per year. Ships, to carry the war to our enemies, slide down the ways at the rate of two a day. Tanks, trucks, guns, ammunition are pouring out of our "peace" plants in far greater volume than the entire Axis effort can possibly equal. War expenditures in 1943 alone will reach the staggering figure of approximately \$83,000,000,000—an amount equal to our entire national income for 1929. Added to this is the rock-bottom output of essential civilian goods—a very considerable item.

This unprecedented production is taking place while some 9,000,000 men and women, those physically best equipped, have been called to the armed forces. Many of them were taken from industry, and their loss could be repaired only by more efficient equipment and more effective methods.

Rigorous training programs had to be superimposed upon many other abnormal problems facing industry in its high-speed conversion from stoves to boats; from printing machines to guns; from automobiles to airplane engines; from fishing tackle to bomb sights.

This phenomenal task was further complicated by the need for rapid expansion. A modest machine tool industry had to be expanded to handle a volume many times its normal capacity. Steel production had to be increased by 20%, and that of aluminum and magnesium multiplied over and over. From almost nil the demand for high octane gasoline soared to unbelievable quantities. The creation of synthetic rubber and electronic industries was necessary almost overnight.

Who deserves credit for these accomplishments? All industry! The engineers, chemists, designers, skilled workers, common laborers. But over and above all it belongs to management.

In industry it is mandatory to have a directive force to coordinate the efforts of men in the use of materials and the application of power toward the production of goods and services. The application of this directive force is the function of management, and only because we had today's kind of management were we able to transform ourselves, almost overnight, from a peace-loving nation to the world's greatest producer of implements of war. As a nation, we had been preparing for a long time to play our part in world affairs. This preparation, certainly not planned for today's objectives but none the less effective, began some four decades ago.

With the advent of the twentieth century, the character of industry in the United States, and, therefore, the character of American living, began to change. Scientific management was born. Frederick W. Taylor brought into focus and showed how to use effectively those processes and procedures upon which our present-day mass production is based. He was followed by Harrington Emerson, who made the industrial world acquainted with efficiency in manufacture and the remarkable progress to be gained therefrom in the field of production, with its consequent price

reductions and wider distribution of industry's products. There followed, in industry, an alert management, a capable management, a management with vision. Without it, the work of Taylor and Emerson would have gone for naught.

It is because of this early work of management—and the extraordinary developments it produced—that the country as a whole, and particularly those employed in industry, were not over-awed by the seemingly impossible job of quick conversion to all-out war production. But let us look back four decades and examine some of those preparatory accomplishments which have proven so vital to the progress and welfare of the nation.

From 1900 to 1939 (the last pre-war year), total employment of all kinds increased 52 per cent; in the manufacturing industries alone the increase was 84 per cent. *The nation became definitely industrial.*

In 1900 the average wage earner was able to spend only 20.2 per cent of his income for things other than necessities; in 1939 his buying power for non-essentials had increased to 34.8 per cent. *The average man acquired confidence in what industry could do.*

In 1900 the average work week was 56 hours; in 1930 it was 48 hours. *The burden of production was being transferred from man to machine.*

In 1939 the United States possessed 30 per cent of the world's railroads, 72 per cent of its automobiles, 49 per cent of its telephones. *The nation's production equipment had grown to formidable proportions.*

In 1939 nearly half of the families in the United States owned their own homes. 64 million individuals carried life insurance policies and 45 million had savings accounts. National income had increased 300 per cent from 1900 and during the same period the proportion of national income paid out in salaries and wages increased from 58 to 70 per cent. And in less than this period (1914-1939) the purchasing power of the wage rate increased by 60 per cent. *There had been evolved the kind of living for which men will work—and fight.*

Since 1900, factories increased their output of goods from \$11,000,000,000 to \$60,000,000,000 in 1939. This increase of nearly 450 per cent was accomplished while the country's population rose only 60 per cent. In this same span of years, technological developments and improvements in methods had increased the value added by manufacture per wage earner by 200 per cent, and the horsepower per factory worker had been multiplied by 2½. *The nation's production plant was ready to assume its gigantic wartime job.*

During this period of industrial and national

evolution, management itself had changed. Prior to the advent of scientific management, our goods and services were the product of several kinds of directive activities, varying from the strictly paternalistic to the ruthless. There was little conception of the responsibility that industry now broadly acknowledges—the responsibility of trusteeship in the interest of stockholders, employees and the public—specifically; in the interest of our national economy—generally. Acceptance of this stewardship is acceptance, also, of the belief that, in the long run, no industry, and no unit of industry, that does not serve society can live.

Have the actions of management caused the times to change? Or has an alert management been successful only because it has changed with the times? Certainly, the industrial concern of 1900 would not thrive under the conditions of today. Just as certainly the new things that industry has in store for a waiting postwar world will have a far-reaching effect upon the times.

Management today seldom owns the factory or the business it manages. It is hired to perform the coordinating, directive functions. It is free to change—of itself, or with the times. Management therefore exercises its power through leadership in executing ideas . . . not through ownership.

Good management can be sustained only in an environment sympathetic to its aims. It has an undeniable obligation to society, because it must be a compatible part of the social structure or be rejected by that structure as a whole.

An environment sympathetic to its aims means, also, that industry, in the very serious reconstruction period ahead, will not be at full effectiveness if it is subjected to attacks by government no matter what the underlying reasons may be—over-zealous devotion to a cause, lack of understanding or just plain politics. It was to industry—to industrial management—that the government turned when our existence as a free nation was threatened; it is to industrial management that government must turn in order to win the peace.

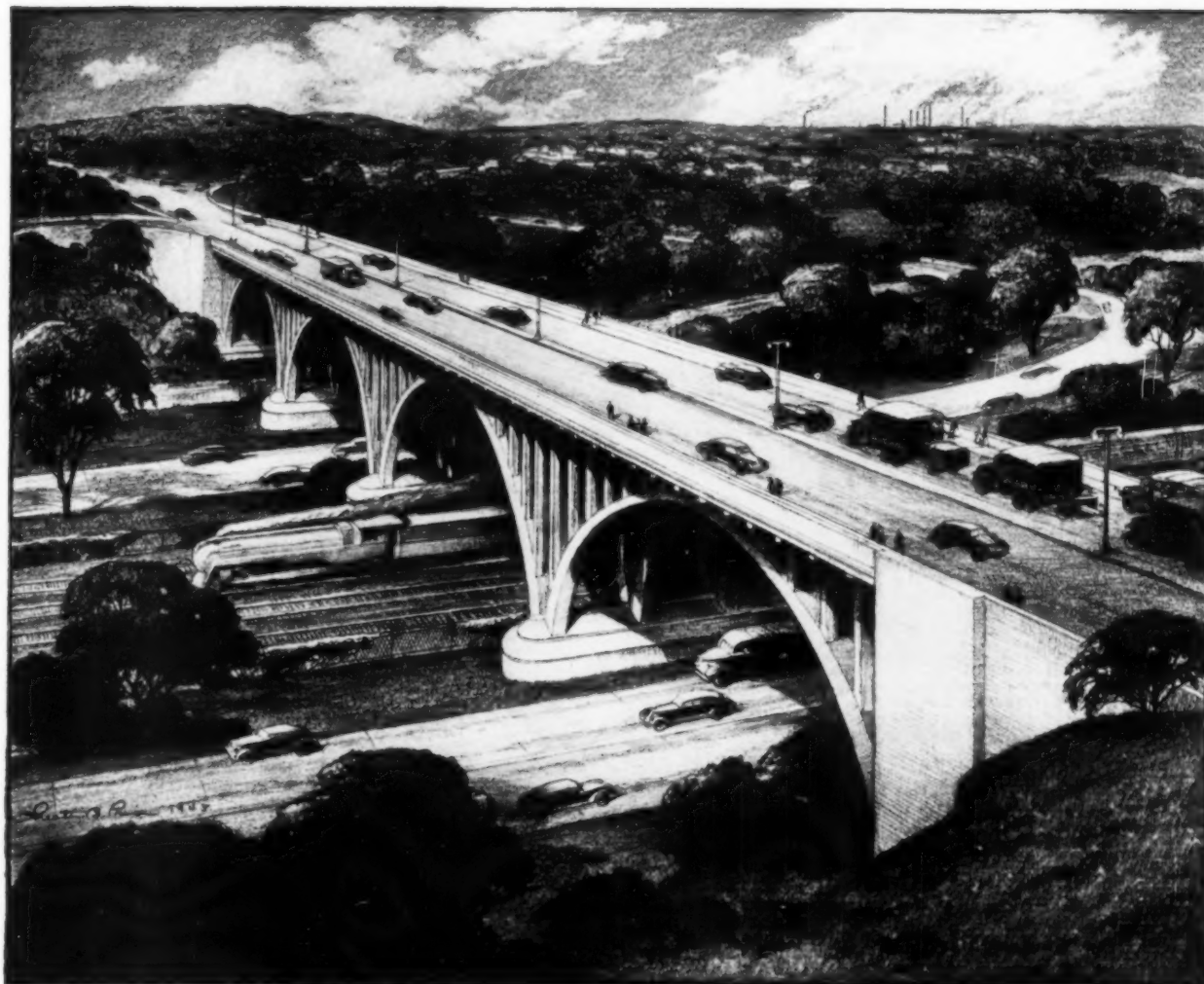
This statement is made in the sincere conviction that what has made America strong is industry's ability to produce consistently more and more goods and services for more and more people. It is only by actually creating them that we built up our stockpiles of the necessities of life. And it is only by creating them that we can have more of those things that make life worth while. These become available to more people as industry succeeds in getting greater output of goods and services for a given input of human energy, materials and power.

And what of the physical jobs ahead? In this country alone, there will be an immense demand upon industry to supply the things people have been unable to purchase during the war. Today the nation is wearing out not only its automobiles, refrigerators, vacuum cleaners and radios, but its very houses, its roads, railroads, and airline equipment. It is saving its money while whetting its appetite. Truly, the calls the American people will make upon industry in the postwar period will be many and insistent.

This is the fourteenth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.



President, McGraw-Hill Publishing Company, Inc.



YOUR MONEY'S WORTH IN CONCRETE

TODAY'S demands on concrete call for speed and economy in construction—and durability in service. That means selecting, for each part of the project, the type of cement which produces the lowest concreting cost—forms, time and cement all considered. Between them, Lone Star Cement and 'Incor' 24-Hour Cement cover the entire range of today's concreting problems . . . maximum speed at minimum cost. This bridge illustrates the point:

LONE STAR CEMENT for substructure where

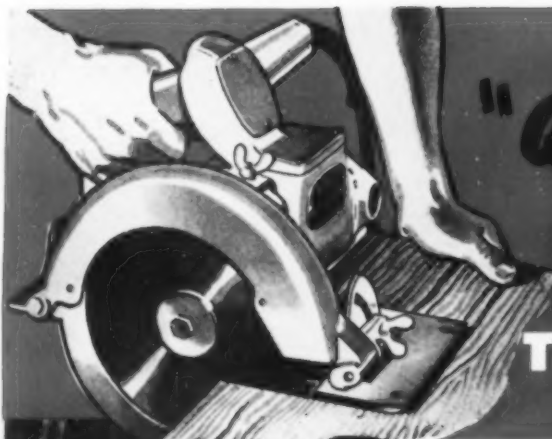
there's time for curing and hardening . . . 'INCOR' in the superstructure, where dependable 24-hour service strengths permit streamlining of construction schedule with 50% to 60% less forms . . . sound practice today, with both time and lumber at a premium.

Lone Star Cement and 'Incor'* produce concrete of outstanding durability. So let job analysis determine which cement to use. Selective concreting with these cements is the soundest way to get your money's worth in concrete.

*Reg. U. S. Pat. Off.

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QUICK-SAW WITH ABRASIVE DISC CUTS THROUGH STONE QUICKLY AND CLEANLY



QUICK-SAW WITH COMBINATION BLADE CUTS STAIR STRINGERS QUICKLY



QUICK-SAW AND ABRASIVE DISC CUTS TOUGH ASBESTOS CEMENT MATERIAL



QUICK-SAW RIPS THROUGH STRUCTURAL TIMBER

THE sawing operations illustrated here show why contractors specify Black & Decker Electric Quick-Saws to speed-up all types of construction jobs. Powerful, flexible Black & Decker Saws are built to cut through wood, composition materials and metals 10 times faster than these sawing jobs can be done by hand.

Three models of Quick-Saws are available for practically every sawing job. Can be equipped with abrasive discs to cut through stone, ceramics and hard ferrous metals . . . or with planer, miter, friction and nail-cutting blades. They're all Universal . . . can be plugged in any electric socket or portable generator.

Absolutely safe . . . with instant-acting, telescoping blade guards and instant-release safety switches. Plenty of power . . . with reserve capacity to take the tough spots without overheating or slowing up. Housings are light, strong, perfectly balanced . . . for easy, accurate handling.

Contractors prefer Black & Decker Electric Tools because they can be bought on the job from nearby Distributors in all large cities. And there's a B & D Factory Branch close at hand, always ready to provide quick service on replacement parts or repairs. The Black & Decker Mfg. Co., 759 Penna. Ave., Towson-4, Md.



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QUICK-SAW CUTS THROUGH FORM LUMBER EASILY



QUICK-SAW USED FOR FASTER, EASIER RABBETING

Timely Tips for Contractors

- Keep your equipment in good shape. Well lubricated, oiled, cleaned . . . check over it regularly. New tools are hard to get.
- "Know" your tools and have your men "know" them better. Send for new "Know How" handbooks on proper care and use of electric tools.
- Throw idle scrap metal, old tools, obsolete equipment into the fight. Uncle Sam needs all you can give him now to win this war.

☐ Saw Handbook ☐ Hammer Handbook ☐ Proper Use & Care of Drills

GET IN THE SCRAP WITH YOUR SCRAP

Dust = Delay



Note the excellent control of dust on the job views shown here. At the top, Rear-Dump EUCLIDS at work in a stone quarry, North Carolina; hauling earth and stone for a dam in New York; Euclid tractor with special water wagon for dust control and compaction work at a California dam; right, Bottom-Dump EUCLIDS on the haul road at an airport in Florida.

● Dust on mining, industrial and construction jobs where heavy duty hauling equipment is used is much more than just a mere nuisance—it is a mighty costly item because it results in decreased efficiency of both men and machines. A diesel engine, for example, may be fitted with one or more air cleaners, but not even the finest filter can remove *all* the dust. Eventually, dust that is by-passed causes excessive wear on sleeves, bearings, pistons and other internal parts, causing premature failure and breakdowns. Moving parts which are lubricated and exposed are also damaged by the abrasive action of dust-laden grease and oil.

Time, money and equipment used in the elimination or control of dust on your jobs is a sound investment rather than an expense, and you will be helping to make hard-to-get replacement parts available for more of the equipment that must be kept in operation 'til victory.

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For EARTH.. ROCK.. COAL.. ORE

CRAWLER WAGONS • ROTARY SCRAPERS • TAMPING ROLLERS



PLANE

Blaster

PROTECTED from flying particles of grit and metal by his "diver's" helmet, this aircraft worker is sand-blasting the fuselage frame of a PT-17 Primary Trainer. Furnishing air at over 100 lbs. pressure to do this work, as well as supplying a light wash of fresh air within the helmet, are important uses of air compressors.

To keep air compressors at maximum efficiency, not only for this vital war work, but for all types of industrial service throughout America, operators everywhere are lubricating them with Texaco.

Texaco Alcaid, Algol or Ursa Oils keep compressors free from hard carbon deposits.

Valves open wide and shut pressure-tight; rings stay free, ports and air lines clear.

So effective have Texaco lubricants proved in increasing output that they are definitely preferred in many important fields, a few of which are listed in the panel.

A Texaco Lubrication Engineer will gladly cooperate in the selection of the most suitable lubricants for your equipment. Just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write:

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- ★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.
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U. S. is lubricated with Texaco than with any other brand.

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★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.



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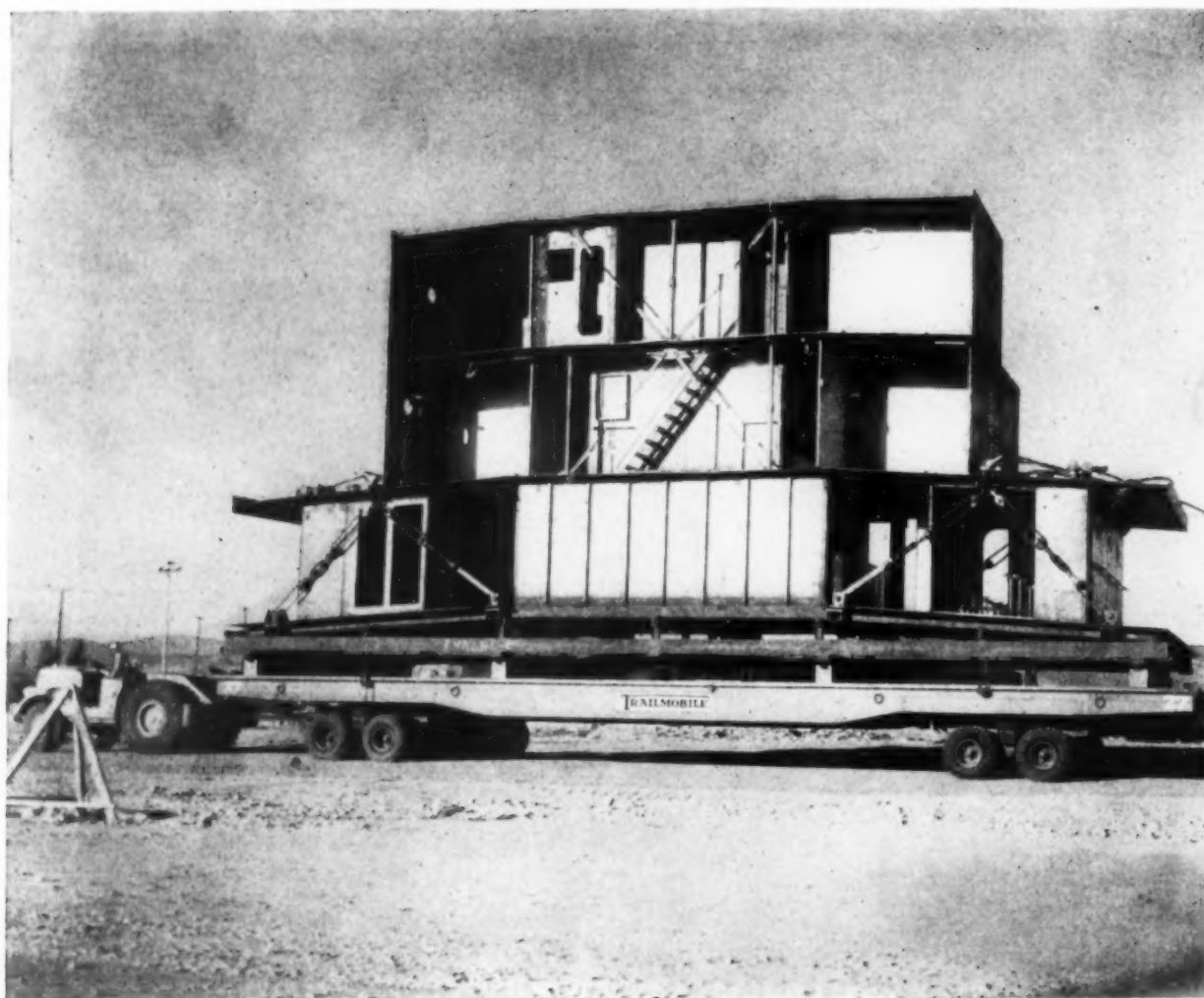
TUNE IN THE TEXACO STAR THEATRE EVERY SUNDAY NIGHT—HELP



Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

— **HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY**



How They Deliver Victory Ships in 150-Ton Slices!

A typical example of B. F. Goodrich leadership in tires

YOU'VE seen some pretty big war loads on our highways lately. But did you ever see one like this? High as a house, heavy as a locomotive, it's a prefabricated segment of a Victory Ship on its way to the sea.

Just look at that driver! He's dwarfed almost beyond recognition by the pile of steel at his back. And look at that trailer! It's as long as a railroad flat car. Yet trailer and 150-ton load roll smoothly and safely along—on B. F. Goodrich Speedliner Silvertowns!

Ever since Pearl Harbor these sturdy, reliable Speedliners have been delivering the goods under the most grueling conditions ever faced by man or machine. At 50 below and in hub-deep

mud they helped build the Alaskan Highway. Under blazing desert skies and in sand that cuts like steel filings they brought up the men and munitions that pushed Rommel out of Africa.

As for everyday jobs—they're doing them, too. Up and down the land Speedliner Silvertowns are setting amazing new mileage records on all types of trucking operations. And while you may never have to move ship sections or fight your way through mud and sand, it's certainly reassuring to have such mighty reserves of

strength and durability at your service

Remember the leadership of B. F. Goodrich when next you buy truck tires. And remember to see your B. F. Goodrich dealer *first*.



PLAN AHEAD

FOR "CATERPILLAR" DEALER SERVICE

OCTOBER

					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
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THESE WAR DAYS, all of us have to plan our time, just as we figure ahead so we won't be caught without gasoline—or butter—or shoes. It's even more important to anticipate the needs of your "Caterpillar" Diesel equipment.

Your "Caterpillar" dealer has a big job on his hands, keeping all the heavy equipment in his territory in good running order. On the other hand, it's vital to you that your machine lose as few working hours as possible.

A little forethought now may save you a lot of time and expense. Take a look at your calendar. Figure when you will best be able to spare your "Caterpillar" Diesel. Then get in touch with your "Caterpillar" dealer and arrange a date beforehand. A quick inspection will enable him to tell whether a complete overhaul is needed—whether any parts must be replaced—or whether minor adjustments will answer the purpose. If parts are necessary and orders are placed well in advance, he'll be ready to give you prompt service on the day you've set.

Sturdy stamina is built into every "Caterpillar" Diesel. But even such a machine needs service when it's worked overtime month after month. Make advance provision for that service—don't put it off until the eleventh hour. Being forehanded in such matters helps to spread the available materials and man-hours fairly among all owners. It's one way to win the war.

Your "Caterpillar" dealer will do his best for your equipment. And his "best" is mighty good. Modern shop practices and precision tools enable him to make service adjustments and repairs with the least expenditure of money and war-needed metals. If you need a new "Caterpillar" Diesel for war-essential work, he will gladly advise you on how to apply for it. And if you can't obtain a new machine, he will do his utmost to keep your old equipment running.

CATERPILLAR DIESEL

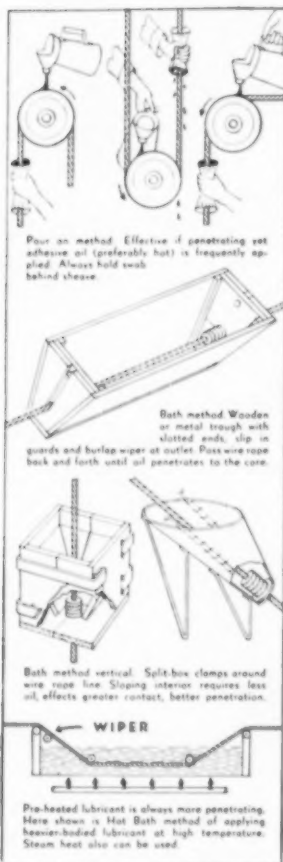
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TO WIN THE WAR: WORK—FIGHT—BUY U. S. WAR BONDS!



WIRE ROPE HAS MANY WORKING PARTS

WHICH MUST BE LUBRICATED!



Nothing can withstand friction forever. Not even the diamonds our toolmakers use in making precision dies for drawing wire. Friction is set up wherever one thing moves while in contact with another. In wire rope, wires move in contact with wires, strands in contact with strands and the core in contact with both. Were this not true wire rope would have no flexibility.

To a high degree the design of Union Wire rope minimizes the harshness of friction. It lays the component parts in such precise repose that they work together with the greatest smoothness. Never-the-less steel works upon steel with increasing pressure as the rope tautens under load and flexes around sheaves.

Only lubrication will protect against the wear of friction. The cores of Union Wire Rope are specially treated to provide some initial internal lubrication. However, they cannot be sufficiently saturated to provide an indefinite supply of lubricant and should not be considered

an oil reservoir. If core lubricant is allowed to become exhausted, the core and subsequently the rope deteriorates rapidly.

Tests show that properly lubricated wire rope withstands from 2½ to 5 times as many bends over sheaves as dry rope.

Illustrated at the left are a few of the methods employed in lubricating wire rope. Application of hot lubricant is more effective. Whether applied hot or cold the lubricant should have the ability to penetrate to the core, to adhere, resist wiping off, to coat both wires and core, to keep out moisture, to preserve as well as lubricate and must be neutral, i.e. free of corroding chemicals. Since each rope use presents its own lubricating problem, more detailed information will be supplied if you will send an outline of your operating conditions.

UNION WIRE ROPE CORPORATION
2160 Manchester Ave., KANSAS CITY, MO.

Tulsa Houston Chicago Salt Lake City New Orleans
Monahans, Texas Portland Ashland, Ky. Atlanta



union
Wire Rope

"THE ULTIMATE LOW COST WIRE ROPE"

WHEN YOU NEED PREFORMED WIRE ROPE SPECIFY **union-formed**

SEND FOR ROPE DOPE • Tells how to make wire rope last longer how to handle and install—other helpful facts. Engineering information supplied without obligation.

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OMAHA, NEBRASKA

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NORTHWESTS

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NORTHWEST is a
**REAL
ROCK
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Drilling a snake hole with the DR30



CLEVELAND DR30 Wagon Drills, in addition to having plenty of speed and stamina, are also remarkably maneuverable. They drill readily in any position and at any angle—straight down, flat, breast high, higher than your head, or within 4" of ground level—even straight up when necessary.

The DR30 has a recoil device to increase cutting speed. The forward leg point steadies the drill. Other important features include a handy centralizer to keep the steel from "walking" while starting a hole. Also a double-screw jack for

moving the U-bar. With a feed capacity of more than 8 feet, the DR30 handles depths to 25 feet and more.

Bulletin 132, sent upon request, explains why the DR30 is the most popular wagon drill ever built.

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YOUR LeTourneau—"Caterpillar" dealer grew up with earthmoving equipment . . . he has worked with you and the factory to build an organization of specialists in the use and service of LeTourneau equipment and "Caterpillar" tractors.

Your demand for the cost-cutting combination of LeTourneau equipment and "Caterpillar" tractors has made possible 186 dealers and branches in United States alone.

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Whenever you need parts and repair service — or priorities information — call the nearest LeTourneau—"Caterpillar" dealer . . . he's listed below.

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Connell, Waterville, Ellensburg, Moses Lake.
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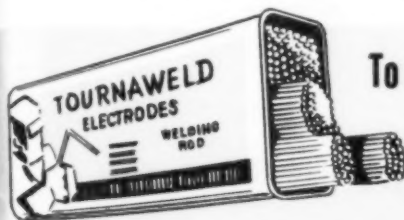
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Developed and Manufactured by
Earthmoving Men for the Construction
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Tournaweld was developed to get a better welding rod for the fabrication of the earthmoving rigs you use on today's tough, battering construction jobs. Into its manufacture goes the welding experience of R. G. LeTourneau, a welder of construction rigs since 1919 . . . and of other LeTourneau earthmovers with 10 to 20 years of practical welding work.

Since we began its manufacture in 1940, more than 15,000,000 pounds of Tournaweld

have been used for the construction and maintenance of LeTourneau equipment. It's used exclusively in the manufacture of all LeTourneau rigs — from the small airborne Tournapull to the world's largest tractor-drawn Carryall Scraper. Dealers and servicemen have found it ideal for repair — we believe you can get no better rod for the repair of your construction equipment.

Today, Tournaweld is made in 7 different types and a variety of sizes to provide a

right rod for every construction repair need. Try it!

Only Tournaweld is made expressly for construction equipment. Compare it on your jobs with conventional rods. Consider price, ease of applying and strength of weld. Tournaweld is sold exclusively through LeTourneau—"Caterpillar" dealers. Subject to WPB limitation orders — for early delivery see your dealer NOW.



LETOURNEAU

To Keep Both Old and New Operating Profitably, Use LeTourneau—"Caterpillar" Dealer Service

If Aladdin Were Twins -



He Could Not Equal the Miracles of Industrial Synergism

Yes, industrial synergism is the name for it. Where Aladdin rubbed his lamp to evoke the fantasies of legend, now men rub ideas against ideas to create realities far in excess of the sum total of the ideas expressed. The stimulus of men thinking together—defined as SYNERGISM—produces the modern magic of progress.

SYNERGISTIC thinking that rubs little ideas against each other sometimes yields outstanding "plus" results.

For example, synergistic thinking between Atlas field engineers, research men and laboratory experimenters produced the Atlas Manasite detonator—and the "plus" result was greater safety.

The extra margin of safety provided by dependable Manasite detonators has enabled

operating men to minimize accidents, reduce loss of man- and equipment-hours and cut down delay.

Of course, no detonator is fool-proof. But the mere fact that nearly 300,000,000 Atlas Manasite detonators have been used is evidence aplenty that synergism counts in giving "2 + 2 = 5" value to products. Manasite detonators cost no more and require neither special equipment nor change in methods of use.

Atlas representatives like to think synergistically with customers. Consult us when you have a blasting problem and find out how synergism can work for the individual contractor.

Manasite: Reg. U. S. Pat. Off.

ATLAS

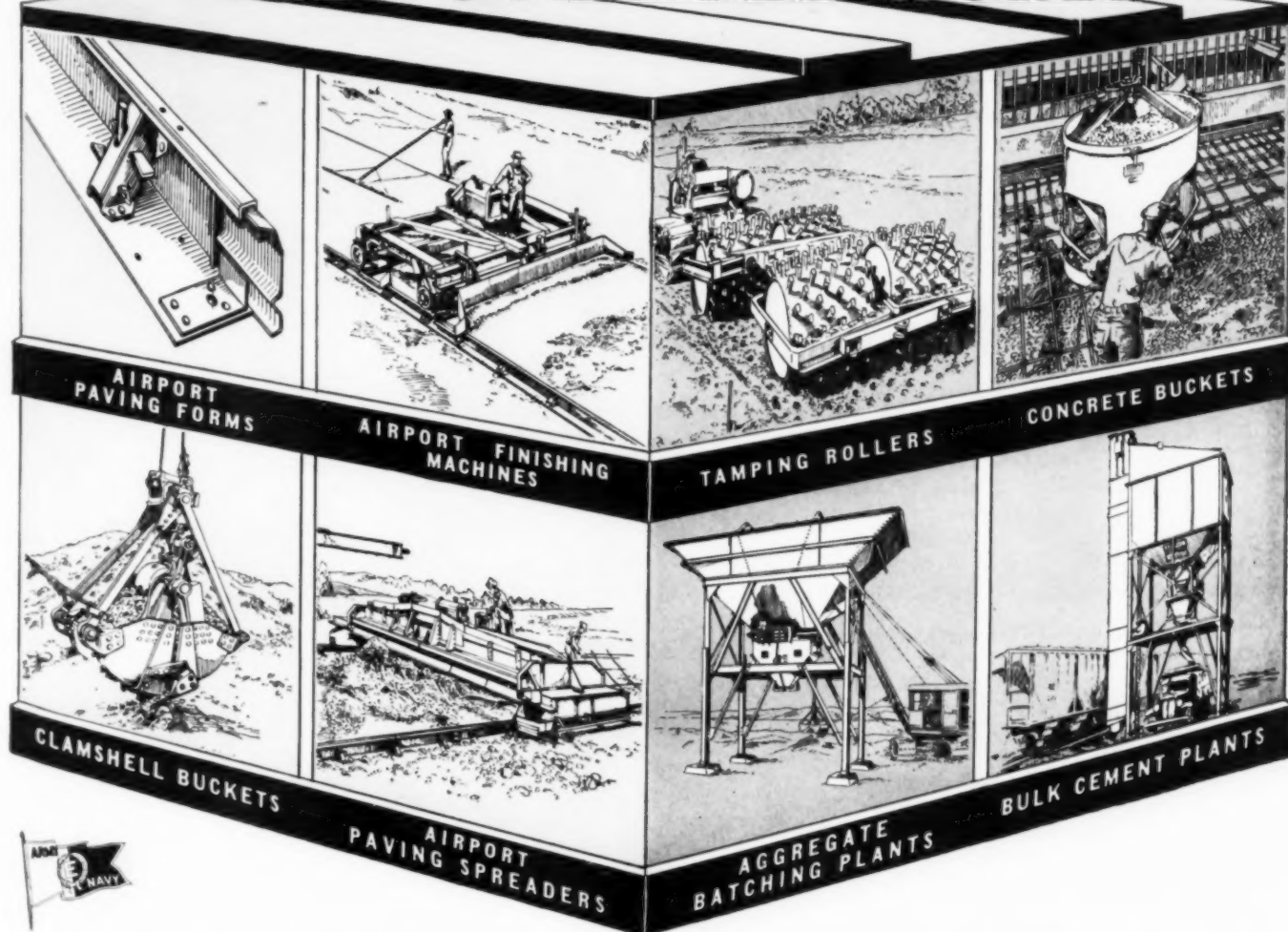
EXPLOSIVES
"Everything for Blasting"



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EARMARKED..

**FOR OUR ARMED FORCES
ALL OVER THE WORLD**



We place great value on the good will and friendship of our customers and distributors. It is our desire to supply their equipment requirements as far as we possibly can — but in all our hearts minds and activities the winning of the war takes precedence — so the production of Blaw-Knox Construction Equipment is earmarked "first for our armed forces."

We have planned to have some units of the above equipment available for shipment to domestic users on essential military projects. An inquiry to your nearest Blaw-Knox Distributor will develop whether we can make shipment and when.

If we cannot supply your needs you will know the reason why — "first for our armed forces."



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★ ★ ★ ★ FOR VICTORY BUY U. S. WAR BONDS AND STAMPS ★ ★ ★ ★

NEVER BEFORE IN ANY WAR...

THE MODERN BOMBER

nor the modern

Preformed wire rope

THAT HELPS IT PERFORM

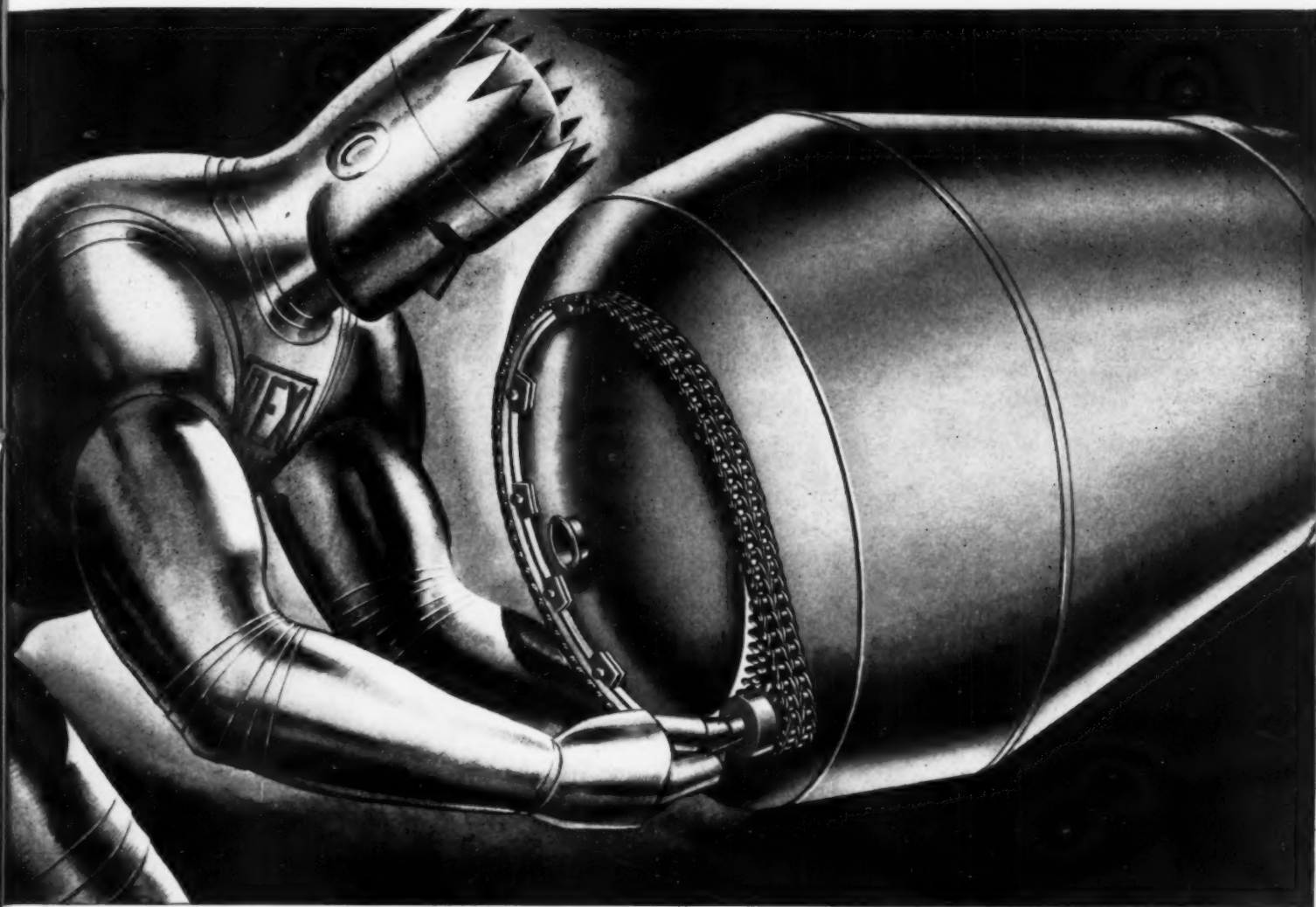
Yes, this is a new and different war. It's a long stride from the frail crates which crept across the troubled skies of 1918 to the modern bombers—today's fabulous flying artillery.

New, also, are the steel sinews of these great planes, made for the first time of Preformed Wire Rope. They convert split-second human reflexes into annihilating action. They race the decisions of alert, fighting brains to rudder, ailerons and elevators; to engines and guns; to turrets and bomb releases.

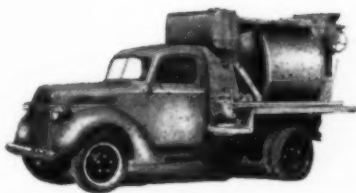
Preformed's peacetime record won this coveted war assignment. For nearly 20 years Preformed has protected and multiplied manpower. It has reduced delays from accidents and change-overs. It has cut costs. Total this—it means top-speed production, which today is imperative.

Ask your own wire rope manufacturer or supplier





HE CUSHIONS ROAD SHOCKS *with his Flexible Drive...*



Truck mixers, rolling along the road, pick up drum vibrations and shocks. These shocks, if transmitted to costly transmissions, power plants and other vital working parts, cause damaging strain and excessive maintenance.

Knowing this, Rex Mechanical Engineering—Rex M. E.—designed his Moto-Mixer with the exclusive flexible chain belt drive—the sturdiest drive in the industry. Because this chain drive goes completely around the drum, and because of the inherent shock absorbent ability of chain belt, each link of the chain absorbs its share of the shock load. This cushions the transmission and other vital working parts from damaging road and mixing shocks. There are no unyielding gears and pinions to bind and create damaging strain as the truck weaves over the road.

Rex M. E. has mounted his drive shaft parallel to the axis of the drum—a direct transmission of power from its

source to its application—the most efficient method of transmitting power.

This is but one of the many features which Rex M. E. has incorporated in the design of his Moto-Mixer. Through many years' experience in the design and manufacture of equipment for the mixing, placing and hauling of concrete, Rex M. E. has learned the problem of the contractor and construction engineer. In the building of Rex construction machinery, he has applied that knowledge in the way most helpful to them.

To give you the whole story, Rex M. E. urges you to write Chain Belt Company, 1664 W. Bruce St., Milwaukee 4, Wis., for complete information on his Moto-Mixer.



**CONSTRUCTION
MACHINERY**

Concrete Mixers • Moto-Mixers • Pumpcretes • Pavers
Mortar and Plaster Mixers • Speed Prime Pumps

CHAIN BELT COMPANY OF MILWAUKEE



OSGOOD

productive capacity is still sold to the limit, but now is a good time for you to investigate the advantages of the MOBIL-CRANE.

THE OSGOOD MOBILCRANE

Moves about freely on its rubber tired wheels. Needs no tracks, rails or special roadway — goes anywhere a large truck can go.

Powered by *one engine*, and operated by *one man* — with independent control of all motions — the MOBILCRANE comes in 3 sizes, 6, 15 and 20 tons.

The
GENERAL
EXCAVATOR CO.

Sizes: 3-12-24
DIESEL - GAS - ELECTRIC

Associated with
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The
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HERCULES
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6 to 12 Tons
Diesel or Gasoline

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OSGOOD

Sizes:

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THE OSGOOD COMPANY, Marion, Ohio



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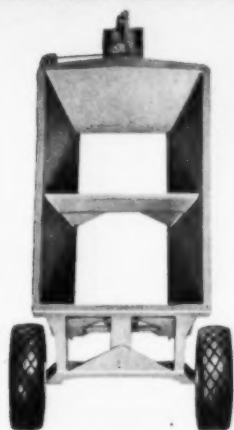
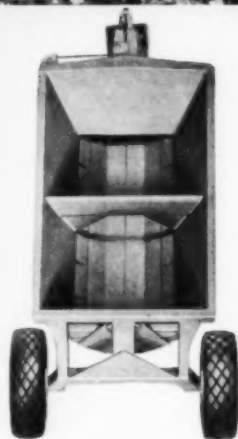


**NEW, Record-breaking
Speed of Operation is
teamed up with Rugged,
Long-life Construction**

... in the new **HEIL Bottom-Dump Wagon**

The revolutionary clamshell principle of its high-clearance, POWER-OPENED, cable-controlled doors has made this new Heil unit an amazing performer — dropping the load in a flash or spreading it almost as with a cable scraper — turning at will off the windrow — moving over the fill with little or no slackening of speed . . . The unit is designed to *maintain* this performance over a long, useful, trouble-free life. The body is an all-welded steel plate unit, reinforced with heavy welded box sections. The doors are built in a box section, reinforced with heavy oak-plank stiffeners for added tensile strength as well as denting resistance when heavy rocks are dumped in. Hinged scraper plates automatically scrape doors clean . . . You can stay out in front — in reputation and profits — with this modern, fast-operating, good-looking equipment. Order now for post-war delivery. Write for bulletin.

R-13



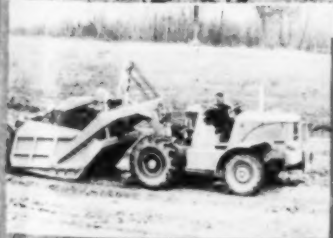
Tremendously Strong Construction for Long Life

Bowl reinforced across center with cross-bolster that holds it rigidly in shape. (Left: View with doors closed. Right: View with doors open.) Control cable passes through bolster.



At left: Heil Hydraulic Bulldozer.

Below: Heil Cable Scraper — interchangeable on same power unit with Heil Bottom-Dump Wagon.



THE HEIL CO.

GENERAL OFFICES

MILWAUKEE 1, WISCONSIN

CORRECT TIMING FOR SLAB FINISHING

Concrete airport runways and aprons, require accurate surface finish for smooth take-off and landing. The Koehring Longitudinal Finisher finishes slab surface accurately by the mechanical method. The *right time* to finish the concrete slab surface is *after* the initial set has occurred. Manual finishing is not always correctly timed because of the physical limitations of the manual method. Koehring Finisher operates efficiently at any distance behind the paver, as determined by the initial set. Be sure, have accuracy, with the Koehring Longitudinal Finisher.

KOEHRING COMPANY • Milwaukee, Wisconsin



Longitudinal Finisher operates accurately at all times, and at any distance behind the paver depending on the initial set.

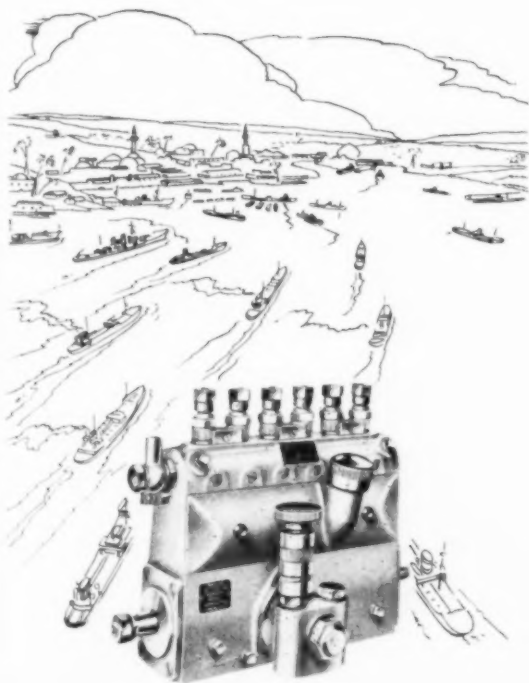


HEAVY-DUTY CONSTRUCTION EQUIPMENT



Nozzle assemblies get final performance test as stroboscope checks actual spray pattern

10,000 "A" Books for Eisenhower



PRECIOUS CARGO in every convoy is gasoline, with many a tanker carrying the equivalent of 10,000 "A" books for our Allies and expeditionary forces. Tankers must keep pace with the fleet, for U-boats prey on stragglers. For safe, dependable power, most tankers today are built around Diesel engines.

Hundreds of tankers will be launched this year, and thousands of other craft as well, each with one or more Diesel engines for prime or auxiliary power . . . and each engine with its own fuel injection system.

To meet this tremendous demand for fuel injection equipment, American Bosch has greatly expanded production. Key to continued high quality under these conditions is our staff of *specialist* craftsmen — many relative newcomers who have learned *few* jobs but each *extremely well*. Thus American Bosch planning, engineering, tooling, and training — the modern interpretation of New England craftsmanship — help produce Diesels to keep sending "A" books to Eisenhower.

When Victory is won, Diesel engines will supply power for the immense task of rebuilding the world. Then as now, American Bosch research, design, and production will serve every branch of the internal combustion engine industry. *American Bosch Corporation, Springfield, Massachusetts.*

AMERICAN BOSCH

AVIATION AND AUTOMOTIVE ELECTRICAL PRODUCTS . . . FUEL INJECTION EQUIPMENT

MODERN CRAFTSMEN IN THE NEW ENGLAND TRADITION

Shock Loads Sabotage Wire Rope

{This is Number 15 in a series of informative articles on the conservation of wire rope. The previous article, Number 14, discussed the "Breaking-In Period" of wire rope. The present article endeavors to show how wire rope will last longer if shock loads are avoided after proper breaking in.}

LET'S AVOID SHOCK LOADS

How simple things would be if there were no "ups and downs" in life. Take wire rope as an example. If operating conditions for your rope were always "peaches and cream" . . . if you didn't have to accelerate or speed up to meet performance expectations . . . if nothing went wrong to throw unexpected stresses on wire rope . . . if there weren't any "ifs," what a lot of unexplained things that now happen to wire rope we would never see.

But wire rope will continue to meet unexpected and unforeseen stresses. Knowing that, let's avoid shock loads that obviously overstress the rope.

WHAT ARE SHOCK LOADS?

Wire ropes are made to a specified catalog breaking strength. All hoisting equipment is designed with a predetermined line pull or load at drum for loads the equipment is made to handle. *Any load above the normal working load can develop a shock load.* And shock loads today are very definitely saboteurs of the war program.

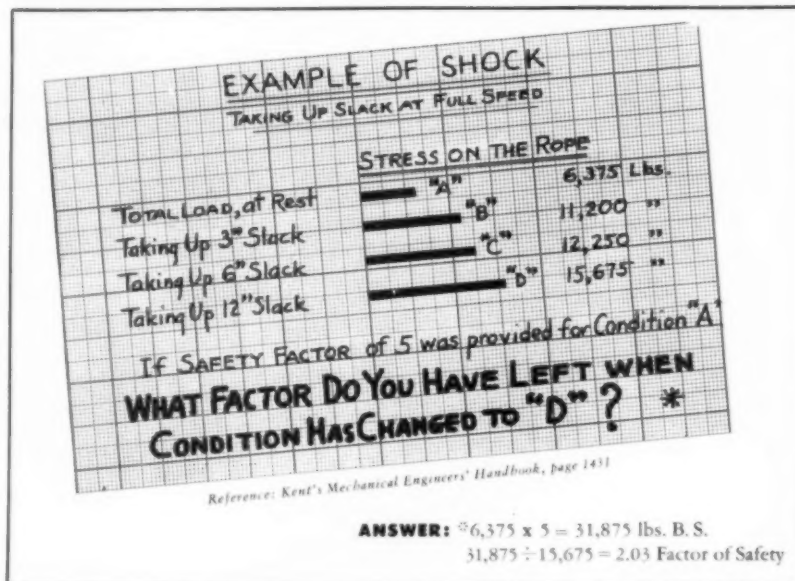
Look, for example, at the chart. There you see what happens when a given load is applied suddenly to a slack rope. The



**MONARCH Whyte Strand
PRE-FORMED WIRE ROPE**

... Macwhyte premier wire rope,
famous for its strength, toughness,
and internal lubrication.

NO. 680



given load (in this case 6,375 lbs.) remains the same BUT the sudden impact to the rope the second that slack is taken up creates a shock load that may exceed the rope's elastic limit. The result may not be an immediate break, but, because the rope is overstressed, it often fails on another operating shift, with another operator, who does not know about the overstressed condition of the rope. When the slack to be taken up is 12", for instance, the stress on the rope at impact is 15,675 lbs. . . . or more than twice the total load at rest.

DOESN'T SAFETY FACTOR ABSORB SHOCK LOADS?

Safety factors for wire ropes vary with the type of equipment and use, as explained in article Number 4 of this series. Safety factors are based upon standard normal operations and cannot absorb the excessive shock loads, because these are beyond the normal working loads upon which the safety factor is figured.

HOW CAN YOU AVOID SHOCK LOADS?

1. Make sure there is no slack and no jerking of the rope at the start of loading.
2. Watch carefully the loads hoisted to see

that they are not beyond the rope's proper working load.

3. Do not allow rope to become fouled or jammed either on the drum or by jumping a sheave.

4. Start load carefully—too fast acceleration overloads the rope. Watch how the rope "takes it" on the pick-up. Apply power smoothly and steadily.

OPERATOR ALL IMPORTANT!

Provided the equipment is in good condition and the correct rope is properly installed, the responsibility lies squarely on the operator to avoid shock loads. A good operator is a good rope's best friend, and when this friendship ceases, the rope might just as well be cut up with a torch or emery wheel. An operator can "make or break" a wire rope. There is no substitute for experience in handling rope and a desire to get the most out of it.

ALL 15 ARTICLES AVAILABLE ON REQUEST

For the benefit of those who want helpful information on how to conserve their wire rope, Macwhyte Company, its distributors, or mill depots will gladly send a set of all articles when requested on your letterhead.

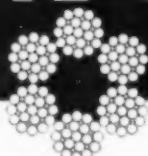
MACWHYTE COMPANY

WIRE

ROPE



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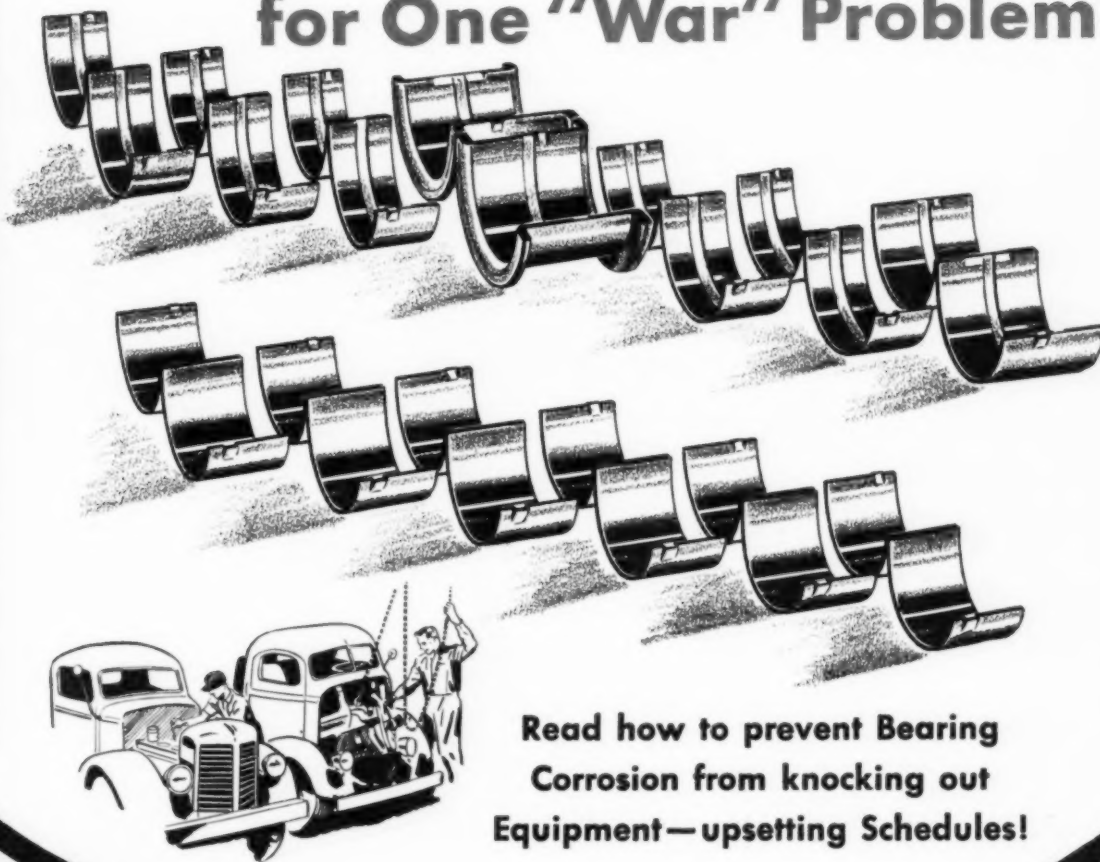


KENOSHA, WISCONSIN

Manufacturers of MACWHYTE PREformed and Internally Lubricated Wire Rope MONARCH WHYTE STRAND Wire Rope
MACWHYTE Special Traction Elevator Rope MACWHYTE Braided Wire Rope Slings MACWHYTE Aircraft Cables and Tie-Rods

SURE CURE

for One "War" Problem!



Read how to prevent Bearing
Corrosion from knocking out
Equipment—upsetting Schedules!

Use DELVAC "900 SERIES" OILS!

These heavy-duty, detergent-type oils possess exceptional performance qualities.

They are not only non-corrosive to hard alloy bearings...but they also resist to an extreme degree the formation of fuel or oil oxidation products—"varnish," "lacquer" and sludge—under high temperature operation.

In addition, these oils hold—suspended in the oil in microscopic size—the products of combustion,

so they do not settle out, form deposits.

In other words, the Delvac "900 Series" Oils give you far cleaner, safer engines than is possible with older-type lubricants. They're recommended for *all* automotive-type Diesels and all gasoline engines operating in heavy-duty service.

SOCONY-VACUUM OIL CO., INC.
and Affiliates: Magnolia Petroleum Co.,
General Petroleum Corporation of Calif.



Mobilgas

SOCONY-VACUUM

**SOCONY-VACUUM FUELS,
LUBRICANTS AND
ENGINEERING SERVICE**



IT'S A TOUGH PROVING GROUND

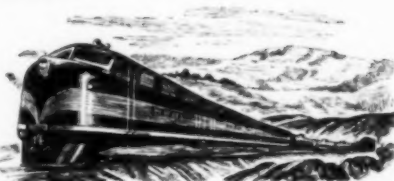
THERE'S hardly a General Motors wheel that isn't whirling exclusively for war.

Yes, the heat's really on. And while we can't tell you how many engines we're building, we can say this. You can find General Motors Diesels from African deserts to Burma jungles—and on the seas between. They're in tanks, trucks, landing and patrol vessels, tractors and many other tools of war.

And although our plants have been greatly expanded, and we're making these engines at many

times the prewar rate, they're still asking for more.

War's a hard taskmaster and a tough proving ground. But when the war is won, these enlarged production facilities for war's demands will mean more economical power for a better peacetime world.



New eras of transportation follow in the footsteps of war. Another new era of transportation is assured in the wake of this war. General Motors Diesel Locomotives already are establishing new standards.



ENGINES . . . 15 to 250 H.P. . . . DETROIT DIESEL ENGINE DIVISION, Detroit, Mich.

ENGINES . . . 150 to 2000 H.P. . . . CLEVELAND DIESEL ENGINE DIVISION, Cleveland, Ohio

LOCOMOTIVES ELECTRO-MOTIVE DIVISION, La Grange, Ill.

There are more
MULTIFOOTE
PAVERS in SERVICE
than any other make!



ADNUN
BLACK TOP
PAVER



MULTIFOOTE
CONCRETE PAVERS

THE FOOTE COMPANY, INC.
Nunda • New York

The World's Largest Exclusive Manufacturers
of Concrete and Black Top Pavers

Be Prepared FOR POST-WAR RE CONSTRUCTION



YOUR share in the re-building of a war-worn world will, in a large measure, be determined by your operating costs . . . Today, on all fronts—at home and abroad—the dependability, operating speed and truck mobility of MICHIGAN Mobile CRANES and SHOVELS are playing a big part in the war against the Axis. And from this most exacting of "proving grounds" will come features which will be even more outstanding than those for which MICHIGAN has long been famous—improvements which will help you to keep costs at a minimum to meet post-war competition.

Write for complete specifications given in Bulletin CM-83.



AIR CONTROLLED
MICHIGAN
POWER SHOVEL CO.
BENTON HARBOR, MICHIGAN

1st Birthday of the M-7



It's the "tank killer" that helped turn the tide at El Alamein...and the British 8th Army and a whole lot of Americans deserve credit for what it did!

It was built without a blueprint just one year ago. It was asked for in three months—and completed in less than three weeks. Rumored had never seen anything like it before—and probably never will see anything like it again. Expertly handled by the men of the British 8th Army, it helped leave 100 of Rommel's tanks blazing wrecks on the sands at El Alamein. Its building was an outstanding example of Democracy at work—for the job was shared. The many intricate parts of the M-7 were turned out in record time by thousands of men and women in garages and machine shops and small manufacturing plants scattered over the country. Without their loyal and unflinching help, the M-7 couldn't have been assembled in such record time or numbers. This achievement is a tribute to all who played a part in the building of this mighty weapon of war.

American Locomotive Company

TO THE FOLLOWING GOES FULL CREDIT FOR THE AMAZING JOB THE M-7 HAS DONE

1. The American Locomotive Company, Bridgeport, Conn., for the design and construction of the M-7.
2. The American Locomotive Company, Bridgeport, Conn., for the design and construction of the M-7.
3. The American Locomotive Company, Bridgeport, Conn., for the design and construction of the M-7.
4. The American Locomotive Company, Bridgeport, Conn., for the design and construction of the M-7.
5. The American Locomotive Company, Bridgeport, Conn., for the design and construction of the M-7.
6. The American Locomotive Company, Bridgeport, Conn., for the design and construction of the M-7.
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9. The American Locomotive Company, Bridgeport, Conn., for the design and construction of the M-7.
10. The American Locomotive Company, Bridgeport, Conn., for the design and construction of the M-7.

American Brass Co., New York
American Brake Shoe & Fdy. Co.,
Chicago Heights, Ill.
American Can Co., New York
American Car & Fdy. Co., New York
American Chain & Cable Co., N. Y.
✓ American Chain Div.
Hazard Wire Rope Div.
American Felt Co., Glenville, Conn.

Thank you

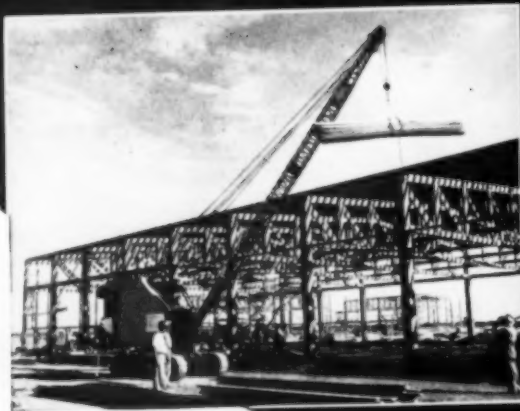
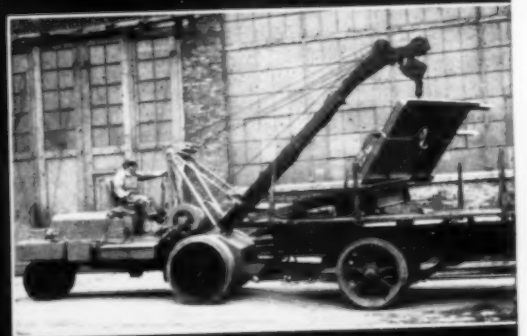
Our congratulations to American Locomotive for this inspiring message. Our thanks to you for including Hazard Wire Rope Division among those who helped build the "tank-killer." • In your list of 445 manufacturers we found 136 who use Hazard Wire Rope in their product, in their plants, or both. • Such interchange of industrial products, such mutual help in times of difficulty, will help win the war, will help win the peace, as it has done from our country's earliest years.

HAZARD WIRE ROPE DIVISION

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Fort Worth, Los Angeles, New York,
Philadelphia, Pittsburgh, San Francisco, Portland, Tacoma

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT, CONNECTICUT

HAZARD LAY-SET *Preformed* **WIRE ROPE**



THERE IS A LINK-BELT SPEEDER FOR EVERY TYPE OF JOB ! *

THERE are many good reasons why Link-Belt Speeder is the choice of contractors who have to work efficiently and quickly in order to do a good and profitable job. Finger-tip control, greater flexibility, rapid booming, greater safety and minimum maintenance—these are but a few of the many plus-features by Link-Belt Speeder's advanced engineering method. Link-Belt Speeder engineers have thus contributed many exclusive developments to the design of shovels, draglines and cranes—developments which have resulted in appreciable advantages to the many contractors using Link-Belt Speeders. No matter how tough the going or how demanding the job, nothing can slow down these rugged precision-engineered machines!

*** 22 DIFFERENT MODELS**

Wheel, Crawler or Pedestal Mounted . . . Rated from 4 to 50 Tons

9211

LINK-BELT SPEEDER

BUILDERS OF THE MOST COMPLETE LINE OF

SHOVELS-

CRANES-

DRAGLINES



**LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO, ILL.
(A DIVISION OF LINK-BELT COMPANY)**

Help Us to Help *You* and the *U.S.A.*

RESPONSIBILITIES OF THE CAR AND TRUCK OWNER

Keep tires properly
inflated

Keep radiator and
battery filled

Get skilled
check-ups regularly



RESPONSIBILITIES OF YOUR CHEVROLET DEALER

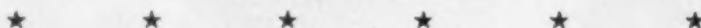
Check your cars and
trucks carefully

Give them skilled,
reliable service

Help to keep them
serving dependably



Help us to
"SAVE THE WHEELS THAT SERVE AMERICA"



Remember — Chevrolet Dealer Service Is America's Most Popular Service
All Makes of Cars and Trucks

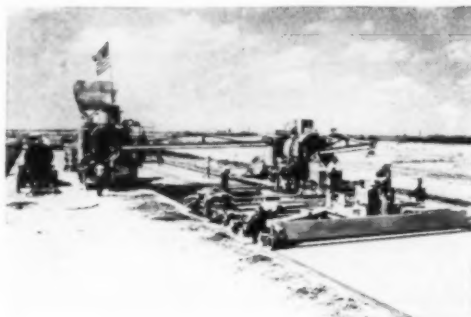
CHEVROLET MOTOR DIVISION, General Motors Corporation, DETROIT, MICHIGAN

How ONE Contractor Paved 240 Miles of Runway Slab AT WAR SPEED

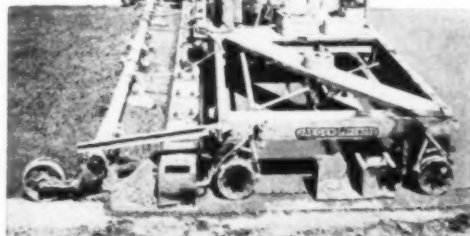
* RUNS OF 300 LIN. FT. PER HOUR OF 25 FT. WIDTH (9'-7"-9") WERE COMMON



USED TWO
34E DUAL DRUM
PAVERS WITH
ONE JAEGER TEAM



EASILY HANDLED
VIBRATORY
MIXES



THE RECORD: In the first 18 months since Pearl Harbor, Koss Construction Co., Des Moines, Ia., completed 13 contracts for over 3,500,000 sq. yds. of concrete airport paving (more than 240 miles of 25 ft. slab)—all poured with 34E dual drum pavers followed by Jaeger Paving Teams (25 ft. Screw Spreader and Type "H" Finisher).

Two of these big pavers were often used with only one Jaeger Spreader-Finisher Team.

THE REPORT: Mr. Richard Koss states: "At no time has this Jaeger equipment failed to keep up with the production of two pavers and this includes all types of weather from the very hottest days to the coldest winter days that we poured concrete . . . In spite of the large amount of yardage already laid, the machines are still in excellent shape."

THE VERDICT: For today's — and tomorrow's — paving needs (steady, high production with small crews) use the Mechanized Paving Team, originated by Jaeger.

THE JAEGER MACHINE COMPANY

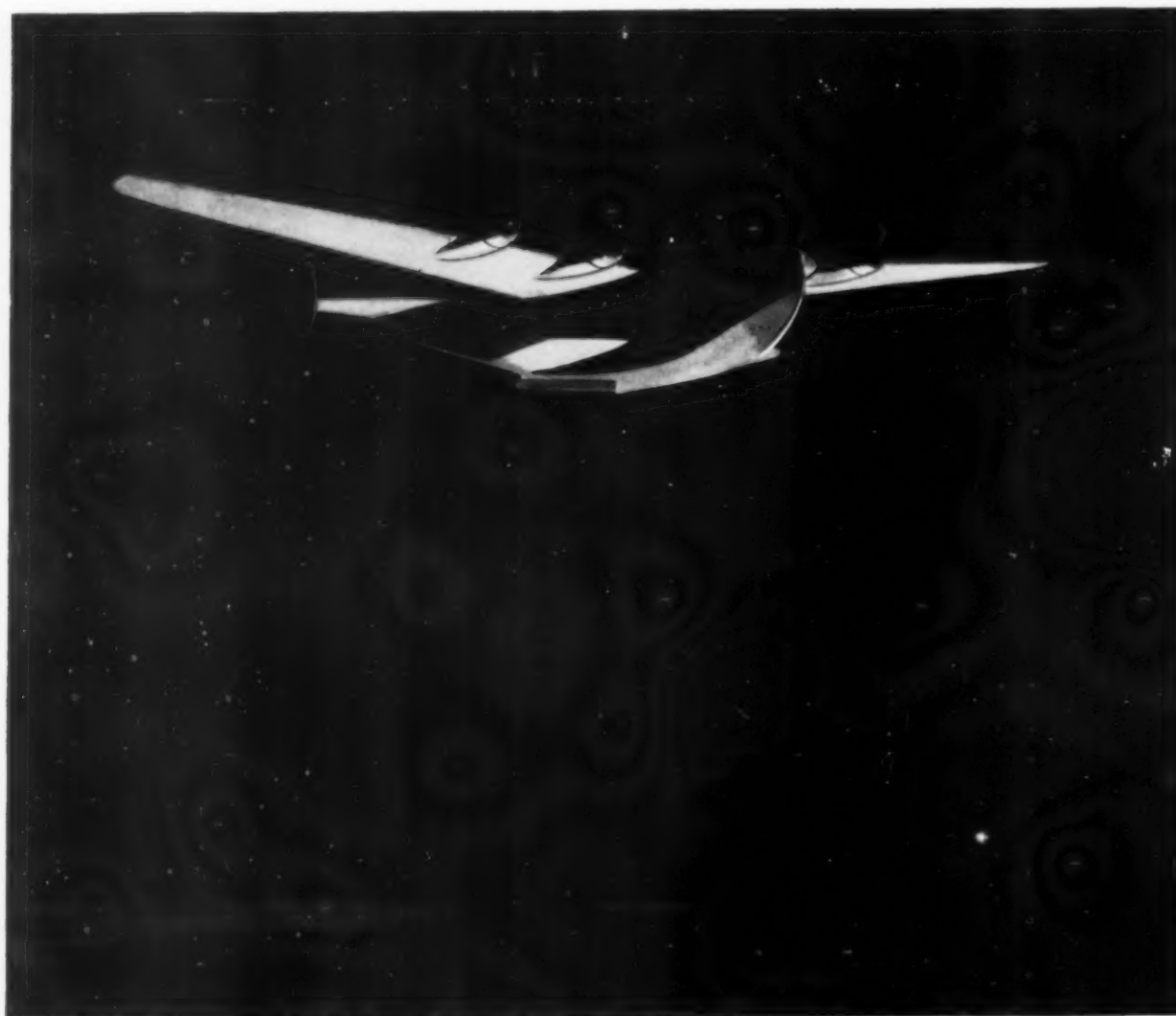
800 Dublin Ave.

Columbus 16, Ohio

Mixers • Pumps • Hoists • Truck Mixers • Concrete and Bituminous Spreaders, Finishers

JAEGER

SCREW CONCRETE SPREADER TYPE "H" FINISHING MACHINE



Clipper pilots have extra eyes

To assist in making night-time landings at the far-flung marine and land bases of Pan American World Airways, every Clipper captain has several "extra eyes"... radio, navigation, wing lights — and a piercing, dependable beacon light.

The big Diesel generators that pump power to these street lamps of the sky are the Clipper stations' nerve centers. They supply electricity for work shops, kitchens and living quarters—as well

as illumination. They must be kept going at top efficiency night and day. To make sure they do, Pan American lubricates its Diesels with RPM DELO.

RPM DELO frequently doubles the time between Diesel overhauls. It ends ring-sticking, protects bearings against corrosion, cuts ring and liner wear to the thinnest minimum. No other lubricating oil gives your Diesels the protection they get from RPM DELO—because no other compounded oil com-

bines its ring-cleaning, non-corrosive and anti-oxidant properties.

ORDER RPM DELO FOR YOUR DIESELS

RPM DELO is marketed under these names:



RPM DELO
Caltex RPM DELO
Kyso RPM DELO
Signal RPM DELO
Sohio RPM DELO
Imperial-RPM DELO
CONCENTRATE

Ask your Diesel engine manufacturer or distributor for the RPM DELO supplier in your vicinity

STANDARD OIL COMPANY OF CALIFORNIA

There's more to conservation than building pipelines



WHETHER it's pushing the "Big Inch" across the continent, or hustling to completion any of the other thousands of wartime pressure jobs—construction equipment is taking a terrific beating today.

Jobs are tough, hours are long, delays are inexcusable—and there just isn't any more equipment available to help carry the load. It's plainly a case of "getting more out of what you've got".

That's why conserving construction equipment is one of the "musts" for smart contractors—and one of the reasons you'll find this Conservation emblem on so much equipment. Whenever you see this red, white and blue emblem on a crane, shovel, tractor, bulldozer or truck, you can be sure that the man on the driver's seat is

1. Working hell out of his machine
2. Taking care of it with proper lubrication, adjustments and all the other things that will help it to come back tomorrow for *another big day*.

Want to join the more than 15,000 who already have this emblem on their machines? Just mail a postcard giving your name and address to The Thew Shovel Co., Lorain, Ohio.

Lorain-40A digging a swimming hole for "Big Inch".



thew **LORAIN**

Registered Trade Mark

**CRANES • SHOVELS
DRAGLINES • MOTO-CRANES**

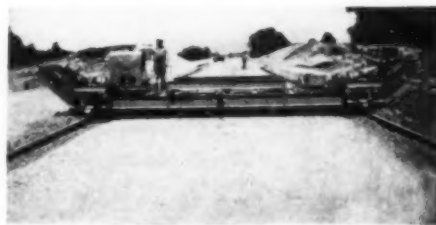


**IF WE CATCH
ENOUGH OF
THESE BIRDS....**

... maybe you won't need a BUCKEYE R-B POWER FINEGRADER!

IF you had a thousand of these fellows swarming all over your grade you might possibly get as much work done as you could with an R-B Power Finegrader. *In the meantime*, you can help speed the day when the prisoner list will look like a roster of Axis-dom by completing vital roads and runways now with R-B machines. These one-man operated Finegraders, available up to 25 ft. width, cut the grade to exact cross section, set a pace for the paving crew, save time and labor, reduce loss of yield and save materials, truck time and transportation.

No other existing equipment can prepare subgrade for paving as quickly, cheaply and accurately as a Buckeye R-B Power Finegrader. Write for bulletin today.



**BUCKEYE
TRACTION DITCHER
COMPANY
Findlay • Ohio**



Built by **Buckeye** ✓

Convertible Shovels



Trenchers



Tractor Equipment



R-B Finegraders



Road Wideners



Spreaders



*Another
Battle Flag
Goes Up the Mast*
at UNION METAL

The United States Maritime Commission has honored Union Metal men and women with its highest award, the Maritime "M" Pennant, for outstanding achievement in the production of tapered tubular steel booms for America's Liberty Ships.

Now that proud pennant, and the Flag of the Victory Fleet, fly over our war-busy plant—together with "Old Glory", the Army and Navy "E", and the Treasury Flag.

Ever since the war began, Union Metal's diligent and patriotic workers have given, and pledge themselves to continue to give, the best that's in them to help speed victory.

Their acceptance of these several honors has been in a spirit of the deepest responsibility toward our Merchant Marine, our armed forces, and our country. It is their will to produce the most possible of the best materials of war in the shortest time.

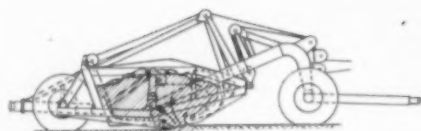


THE UNION METAL MFG. CO. CANTON, OHIO

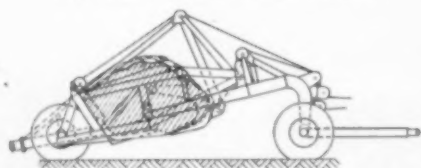
Cargo Booms — Top Masts — Practice Bombs — Recoil Mechanisms — Gun Mounts — and, in peacetime, Steel Street Lighting Standards
— Monotube Steel Pile Casings — Steel Skids and Boxes — Monotube Steel Poles for Distribution and Transmission Lines



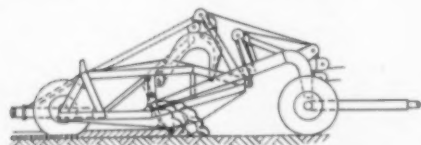
LESS POWER TO LOAD



(1) LOADING POSITION



(2) CARRYING POSITION



(3) DUMPING POSITION

GW Cable-Controlled Scrapers provide three ways to speed-up earth moving, do the job in shorter time—and "clear the way" to Victory!

Illustrations, left, show the loading, carrying and dumping positions. When loading (1) the line of draft is located to prevent the cutting edge from being pulled out of the ground. Weight is evenly distributed. Boiling action of dirt, loads the bowl and gate with a minimum interference of the material already loaded. In the carrying position (2) the high center clearance of the cutting edge is ideal over soft or uneven ground.

Front portion of load dumps (3) by raising the apron. Remainder of the load is forced out efficiently by *positive rolling ejection*, as the bottom of the bowl reaches a steep angle, resulting in less cable wear. Wide space between cutting edge and apron permits dumping large sticky loads without interference. The cutting edge remains fixed while dumping, thus providing accurate control of depth of spread.

The GW Road Machinery line is complete—consisting of both Hydraulic and Cable-Operated Units.

SEE YOUR NEAREST ALLIS-CHALMERS DEALER



CONSTRUCTION MEN
Enlist in the
"SEABEES"

Information given at any U. S.
Navy Recruiting Station (U. S.
Navy, Bureau of Yards and
Docks)

ROAD MACHINERY DIVISION

GARWOOD INDUSTRIES, Inc.
DETROIT



Official U. S. Navy Photograph

OVERSEAS ATTACK

demands top national production. For full maintenance of CONSTRUCTION equipment in heavy duty operation use . . .

SINCLAIR PENNSYLVANIA and OPALINE MOTOR OILS, specialized gear oils and greases. These lubricants reduce wear and parts replacements. They keep equipment on the job.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.



SINCLAIR LUBRICANTS-FUELS

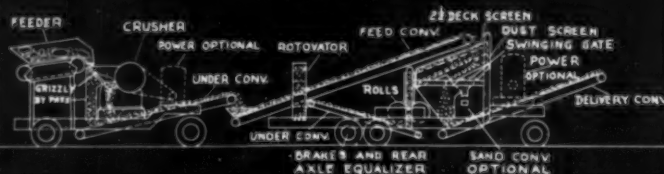
FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY (INC.), 630 FIFTH AVENUE, NEW YORK CITY



*"22,800
Yards Monthly
Average With
Our Universal
822-Q"*

PRIMARY UNIT

SECONDARY UNIT



The 822-Q plant is available in three sizes: 16"x24", 20"x36" or 24"x36" crusher on primary unit; and 24"x16", 30"x18" or 40"x22" rolls on secondary unit.

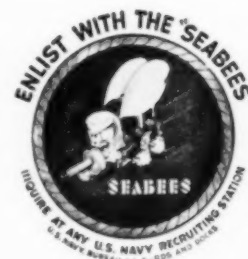
Distribution of weight on two separate trucks provides greater portability, more flexible and faster set-up in quarry and protection to roads.

The Universal 822-Q "Two Unit" Portable Quarry Plant does an even more spectacular job than we claimed for it, according to users' reports.

The plant pictured has a 15"x36" jaw crusher on the primary unit and 30"x18" crushing rolls on the secondary unit. It has been averaging 22,800 yards monthly of $\frac{3}{4}$ " and smaller crushed rock for war construction. "Only repair so far was a toggle replacement. Our diesel fuel costs us a fraction of a cent a yard of crushed material." Another operator reports 25,200 yards of $\frac{3}{4}$ " material over a 30-day period. The 822-Q may be the answer to your present high priority crushing job—and your "no priority" post-war jobs. Ask for Bulletin 30.

UNIVERSAL ENGINEERING CORP.
(Formerly Universal Crusher Co.)

327 8th St. West, Cedar Rapids, Iowa



UNIVERSAL
CRUSHERS, PULVERIZERS, COMPLETE PLANTS, SPREADERROLLERS, PORTABLE ASPHALT PLANTS





PIONEER and LEADER

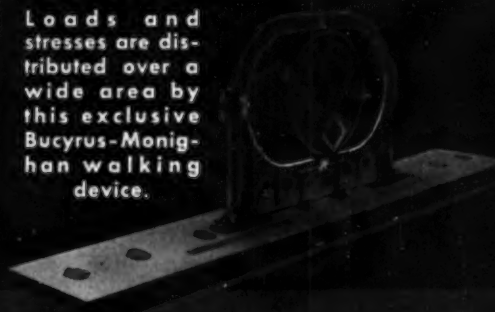
THE first Walking Dragline, a Monighan, was shipped in 1913. During the succeeding 29 years, hundreds of these machines have proved themselves along the muddy banks of the Mississippi, in the sands of the All-American Canal, the rocky terrain of the Pennsylvania Anthracite Region, the remote mines of Alaska, South America, Nigeria, and the Far East. Today, with all-out war putting a tremendous premium on speed and dependability, Bucyrus-Monighan field-proved performance is especially vital.

Originator of the Walking Dragline, Bucyrus-Monighan today offers you a machine which is the result of consistently progressive design based on an unbroken experience dating from the beginnings of draglines. The essential simplicity and strength that stand behind the big output of today's Bucyrus-Monighans can only be the heritage of a long and successful history.

Bucyrus-Erie offers you a complete line of walking draglines, with buckets up to 20 yards in capacity and booms up to 250 feet in length. Whatever your size requirements, you can get a field-proved machine from Bucyrus-Erie.

SIMPLE • STRONG • PROVEN

Loads and stresses are distributed over a wide area by this exclusive Bucyrus-Monighan walking device.



**BUCYRUS
MONIGHAN**

Bucyrus • Erie Co.

SOUTH MILWAUKEE, WISCONSIN

—AMONG OUR OTHER JOBS... PERHAPS WE CAN HELP YOU, TOO!

Close cooperation with the various technical schools established by the Armed Forces is one of our most important war-duties.

We feel that our job does not end until those who are responsible for the operation of the SEAMAN MIXER know how to secure maximum efficiency from the machine under all conditions — and can profit from the knowledge of modern soil-stabilization methods which we have acquired from the experience of many years in the field.

We feel our responsibility extends to the engineer and contractor as well. We welcome every opportunity to be of help and our engineering staff is ready to cooperate in the solution of any soil-stabilization problem that confronts you.

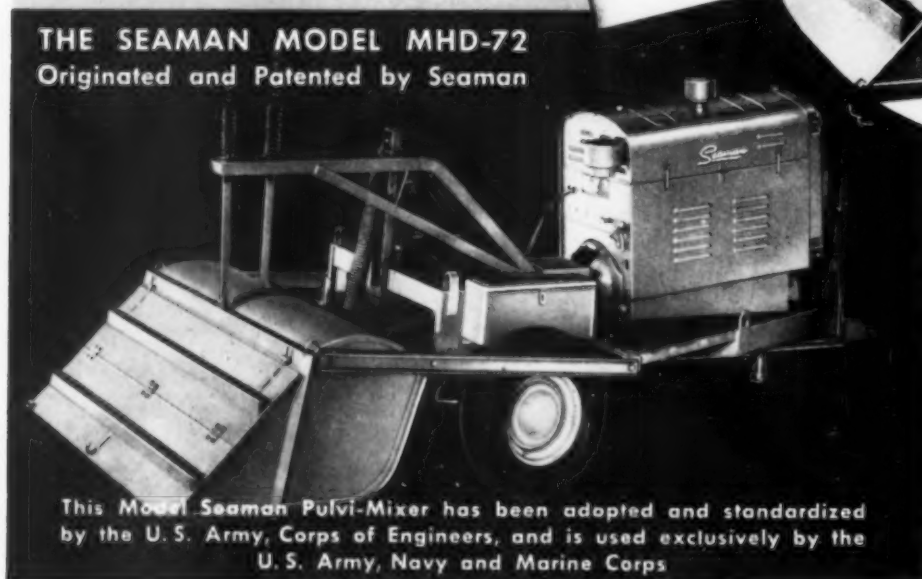
The SEAMAN PULVI MIXER

Here is a book — "Soil-Stabilization Methods" compiled by Seaman engineers, which has been of great help to those concerned with the soil-stabilization field. Army, Navy and Marine Corps schools have used thousands of copies as textbooks. A copy is yours for the asking. Please specify Bulletin 22.



SEAMAN MOTORS
305 N. 25th STREET • MILWAUKEE, WIS.

THE SEAMAN MODEL MHD-72
Originated and Patented by Seaman

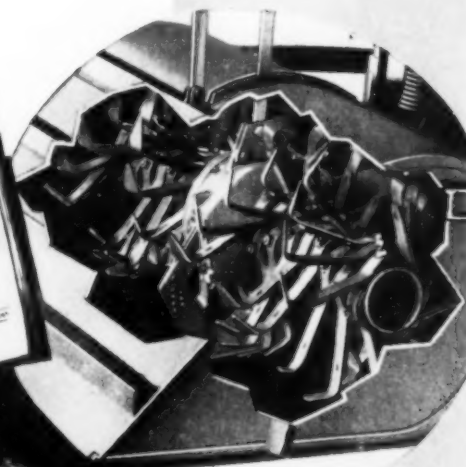


This Model Seaman Pulvi-Mixer has been adopted and standardized by the U. S. Army, Corps of Engineers, and is used exclusively by the U. S. Army, Navy and Marine Corps



PIONEERED

by
Seaman



Above is a cutaway view of the mixing chamber showing arrangement of the mixing tines. These strong, resilient steel tines built to meet extremely adverse conditions — are scientifically designed to attain maximum thoroughness of mix. (Not to be confused with the tillage tines used on the Seaman Tiller as used for agricultural purposes by the U. S. Department of Agriculture).

**Eeeeasy does it
...over she goes!**



ROEBLING "Blue Center" holds her fast



A 50-TON SCHNOZZLE for a cargo vessel is a tricky load to swing around on the end of a line—particularly when that load has to be picked up, *turned over*, and moved gently into place with finger-span accuracy! But watch these boys do it, with two whirley cranes and specially engineered slings! It's apple pie to them, because they've been doing it plenty—to the tune of more than 8,000,000 tons of finished ships in 1942! And they're going to get a lot of chances to improve with practice in floating the 16,000,000 tons planned for 1943!

Without these techniques in handling huge prefabricated ship sections, the phenomenal production rate couldn't have been achieved—and *doubled* this year! Thanks to the men who wouldn't

be satisfied as long as a single ship-building record remained unbroken, our Merchant Marine is getting ships as fast as they can be manned with trained officers and crews! Thanks to the equipment, too, that helped those men break records—bigger cranes, automatic welding machines, *wire rope*...

Yes, wire rope is playing a big part in floating tonnage for Victory. And wherever you find the tough going of handling hunks of ship as big as houses, you'll find Roebling "Blue Center" in there slugging too... Not just in building ships, either, but on construction projects, materials handling jobs, and with every branch of the fighting forces... Bringing to the toughest jobs of all the stamina built into it by more than a hundred years of wire rope engineering!

ROEBLING
"Blue Center"
STEEL WIRE ROPE
PERFORMED OR
NON-PERFORMED

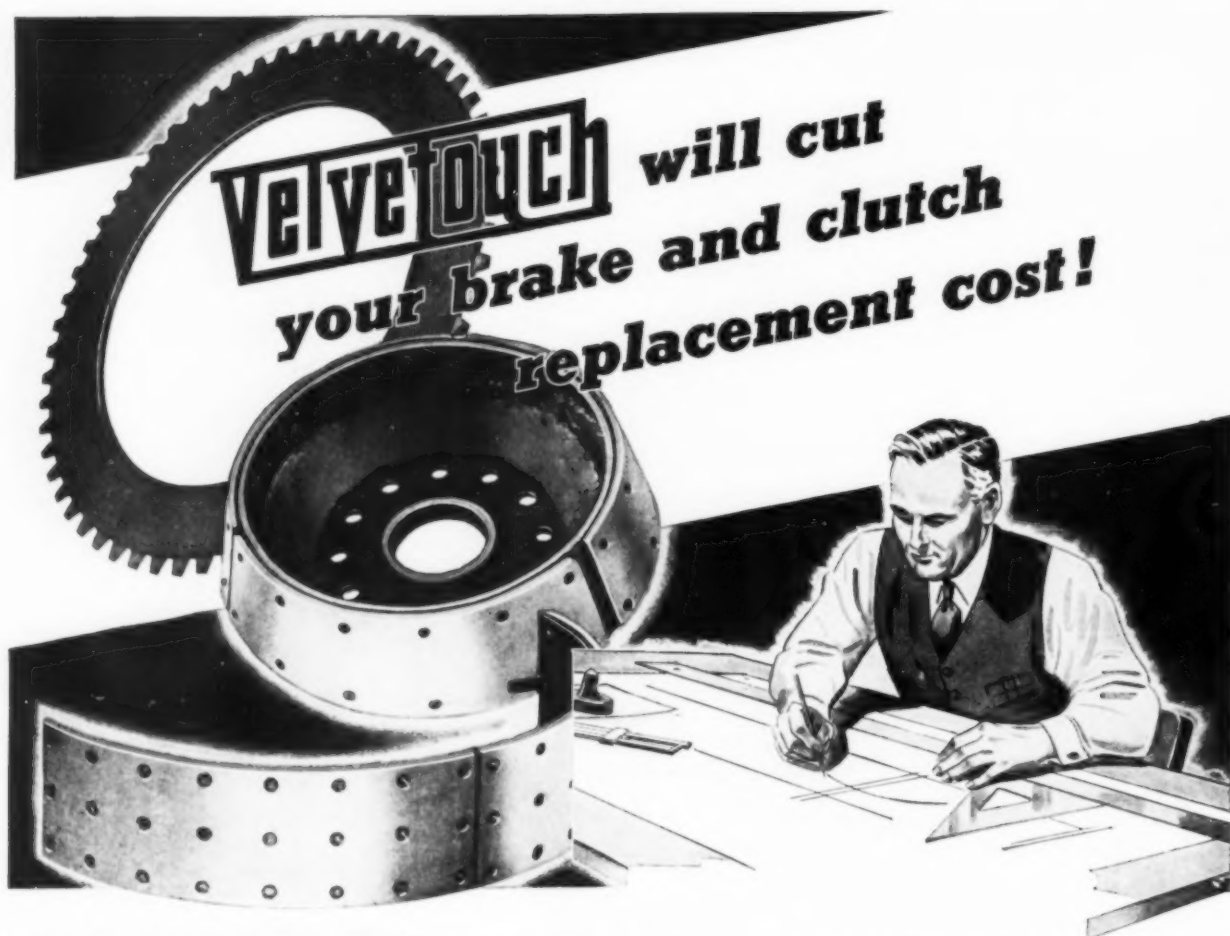


YOU CAN HELP YOUR ROPES HOLD FAST... LONGER!

WHATEVER YOU'RE PRODUCING for Victory, if you're using wire rope, it's a part of your war job to make that rope *last*! Nothing difficult about that, either, if you follow a few simple rules of rope conservation. To make it even easier for you, though, Roebling Engineers have prepared this handy 4x5-inch tag, summarizing the most important and essential points in conserving wire rope. Printed in two colors on heavy stock and varnished for easy wipe-off

cleaning, the Roebling Conservation Tag fastens right on your rope-rigged equipment, where your operators will be constantly reminded of rope conservation as a part of their war jobs! Send for your free supply today. Ask for Tag "A".

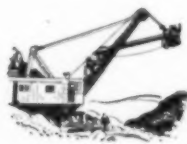
JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY
Branches and Warehouses in Principal Cities



VELVETOUCH is an all-metal friction material—a combination of sintered powdered metals, welded to a solid steel backing. It is engineered to wear many times longer than ordinary clutch facings and brake linings . . . requires fewer adjustments and replacements.

In operation, Velvetouch is smooth and positive. It is not affected by oil, heat or water. Clutches and brakes equipped with Velvetouch never chatter, never slip.

Specify Velvetouch on your tractors and bulldozers. Install it on your power shovels, scrapers, trucks, cement mixers . . . wherever you have a clutch or brake maintenance problem!



TRADE MARK REG. U. S. PAT. OFF.

VELVETOUCH

THE S. K. WELLMAN CO.

1374 EAST 51ST STREET
CLEVELAND, OHIO, U.S.A.

PIONEERS IN PUTTING POWDER METALLURGY TO WORK FOR INDUSTRY

NEW HELP IN SELECTING THE RIGHT AIR TOOLS

Thor

SINKER ROCK DRILLS

NUMBERS
70, 72, 75
and 76

4 POSITION THROTTLE



Four operator controls for all operating conditions: 1. Full off, 2. Starting, 3. Half throttle, 4. Full on.

RIFLE BAR ASSEMBLY



Time tested, reliable construction that assures dependable rotation.

POSITIVE AIR SCREEN



Prevents clogging of machine. Quickly disassembled for cleaning. Heavy standard area for free flow of air.

STRONG STEEL RETAINER



Universal shock which drill steel is being worked from hole. Fully enclosed, dust proof operating parts. Heavy construction.



MEDIUM WEIGHT TOOLS FOR GENERAL PURPOSE DRILLING

A quarter of Sinker that will outdrill any machine in this weight class. General purpose, medium weight machine, the Thor No. 70 Series of Sinker are designed for hard, deep-hole drilling, shaft sinking, quarrying, road building, and general construction work. The four different models offer an unusually wide range of machines for highest drilling performance.

Each machine is of drop-forged steel construction, built durably for hard, long service. Each is extremely low in air consumption. Each is equipped with positive, short travel, tubular valve and full air cushioning. Their hole cleaning ability, both while drilling and blowing, is most effective.

NO. 70 AND 75 SINKERS

The outstanding features of these machines are that they are fast drills, clean drilling, ready to use anywhere, and 75 can be converted to a 70 by changing the 1" or 1 1/2" hexagon or square chuck steel. They can be furnished with tappet construction for positive cushioning. They can be furnished for wet or dry operation and can be converted for use in either drill.

NO. 76 SINKER

The most handy of the No. 70 series, this change-over drilling and easy manipulation of the steel retainer. The exhaust is deflected to the side so that it does not strike the operator nor one close from the rear. Can be furnished with chucks for 1/2", 3/4" or 1" hexagon or square section steel, rolled round section.

NO. 72 SINKER

This drill is of the same design as the No. 70 and 75, but is designed for the same work, with the addition of a 1/2" or 3/4" hexagon or square chuck. The No. 72 can be furnished with tappet construction for positive cushioning. It can be furnished for wet or dry operation, and can be converted for use in either drill.

DESCRIPTIONS

No.	Machine	Chuck
No. 70	Sinker Rock Drill Complete, Dry (Standard Drill)	1" Hexagon
No. 71	Sinker Rock Drill Complete, Wet (Standard Drill)	1" Hexagon
No. 72	Sinker Rock Drill Complete, Dry (Standard Drill)	3/4" Hexagon
No. 73	Sinker Rock Drill Complete, Wet (Standard Drill)	3/4" Hexagon
No. 74	Sinker Rock Drill Complete, Dry (Standard Drill)	1/2" Hexagon
No. 75	Sinker Rock Drill Complete, Wet (Standard Drill)	1/2" Hexagon

SPECIFICATIONS

No.	Machine	Weight (Lbs.)	Length (In.)	Weight (Lbs.)
No. 70	Sinker Rock Drill Complete, Dry (Standard Drill)	25	25	25
No. 71	Sinker Rock Drill Complete, Wet (Standard Drill)	25	25	25
No. 72	Sinker Rock Drill Complete, Dry (Standard Drill)	25	25	25
No. 73	Sinker Rock Drill Complete, Wet (Standard Drill)	25	25	25
No. 74	Sinker Rock Drill Complete, Dry (Standard Drill)	25	25	25
No. 75	Sinker Rock Drill Complete, Wet (Standard Drill)	25	25	25

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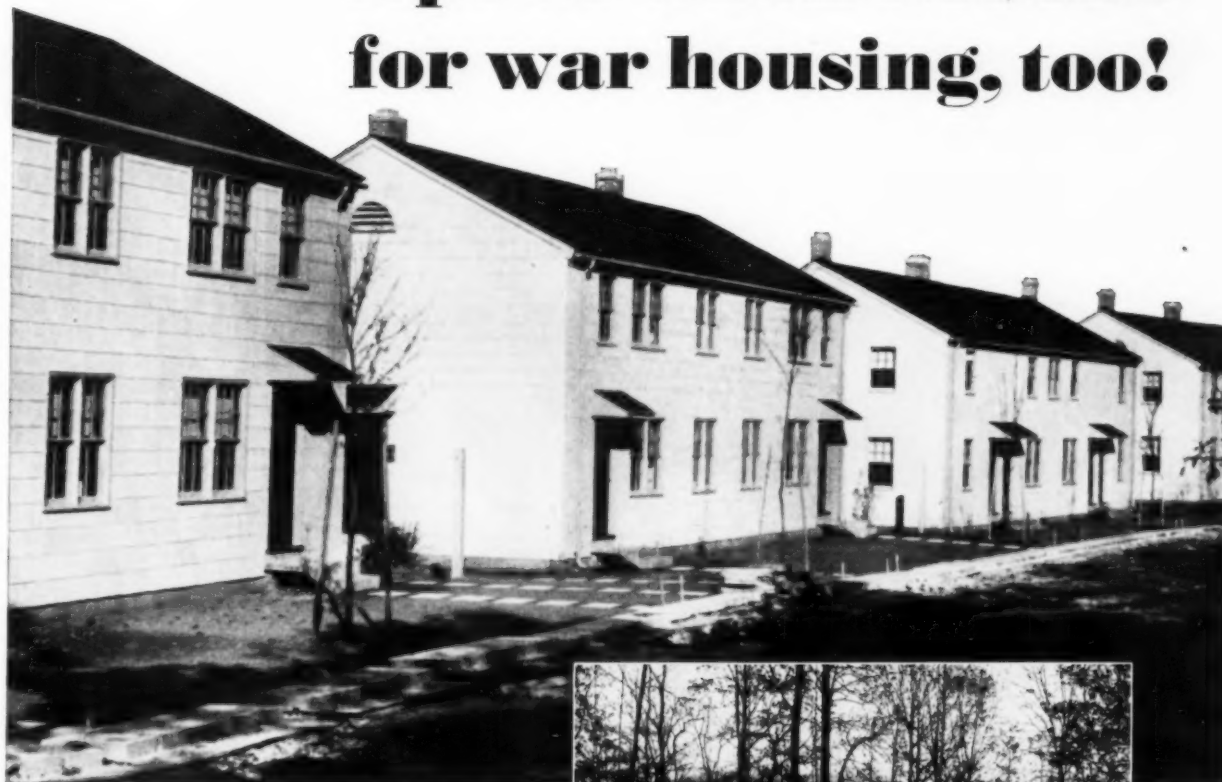
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Speed when needed for war housing, too!



Lehigh Early Strength Cement saved time in this rush-order housing project at Newport, R. I. Blocks were cured in 1/3 to 1/5 normal time, permitting quick handling and use.

Housing for war workers is another phase of the war construction program in which concrete made with Lehigh Cements played an important part. The variety of purposes for which they were used, are reflected in many different types of essential housing structures.

In cases where quicker service strength in the concrete meant speedier occupation, Lehigh Early Strength Cement answered every demand. Examples illustrated on this page, show the adaptability of Lehigh Early Strength Cement as an aid to rapid construction. It comes to service strength 3 to 5 times faster than normal portland cements, providing a finer, denser concrete.

Lehigh Early Strength Cement has been used to speed-up concrete construction in every type of war work, including oil fields, shipyards, aviation, and armament plants. Its advantages apply to every sort



These so-called "bubble houses" at Falls Church, Va., were needed in a hurry. Concrete made with Lehigh Early Strength Cement was shot on inflated balloons with a cement gun. Curing time was saved. Balloons were deflated and re-used in a few hours.

of private and peace-time construction. Let Lehigh's Service Department help solve your special problems.

LEHIGH EARLY STRENGTH CEMENT
FOR SERVICE-STRENGTH CONCRETE IN A HURRY



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The Alaska Military Highway — wartime construction that will aid reconstruction in the peace to come.

IT takes a lot of earth-moving to win the war — and to reconstruct for the peace to come.

Off-the-road equipment is as vital to the home front as it is overseas. Years of Goodyear experience in developing tires for more traction, more speed and more pull is serving everywhere from our own back yard to the Aleutians. And will continue to serve after the last shot is fired.

There is a Goodyear tire for every

type of off-the-road work. Inspect them below — the Goodyear Sure-Grip Grader for mud and marsh, the Goodyear Hard Rock Lug for rock work, and the Goodyear All-Weather Earth-Mover for drawn dirt-movers.

These treads specially designed for every terrain are built on Goodyear's own multiple-compounded construction and low stretch Supertwist cord carcass — proved best to take punishment.

The maximum amount of live rub-

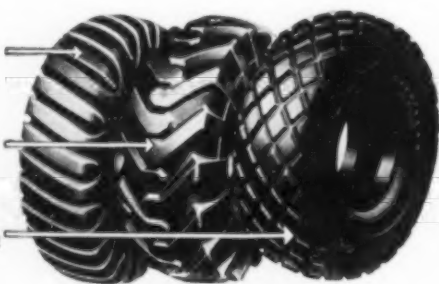
ber, allowed by the government for tiring essential wartime construction projects, goes into all Goodyear off-the-road tires.

To get the most out of your tire certificate — and for your money — play it safe and invest in Goodyears. They won't let you down on your wartime job. For twenty years, this has been a fact: *More tons are hauled on Goodyear truck tires than on any other kind.*

Sure-Grip, All-Weather, Supertwist — T. M.'s The Goodyear Tire & Rubber Company

THE BIG THREE (All with Goodyear multiple-compounded construction and low stretch Supertwist cord carcass)

GOODYEAR
HARD ROCK LUG
for all rock work
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GOODYEAR
SURE-GRIP GRADER
for mud and marsh
+
GOODYEAR
ALL-WEATHER EARTH-MOVER
for drawn dirt-movers



MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

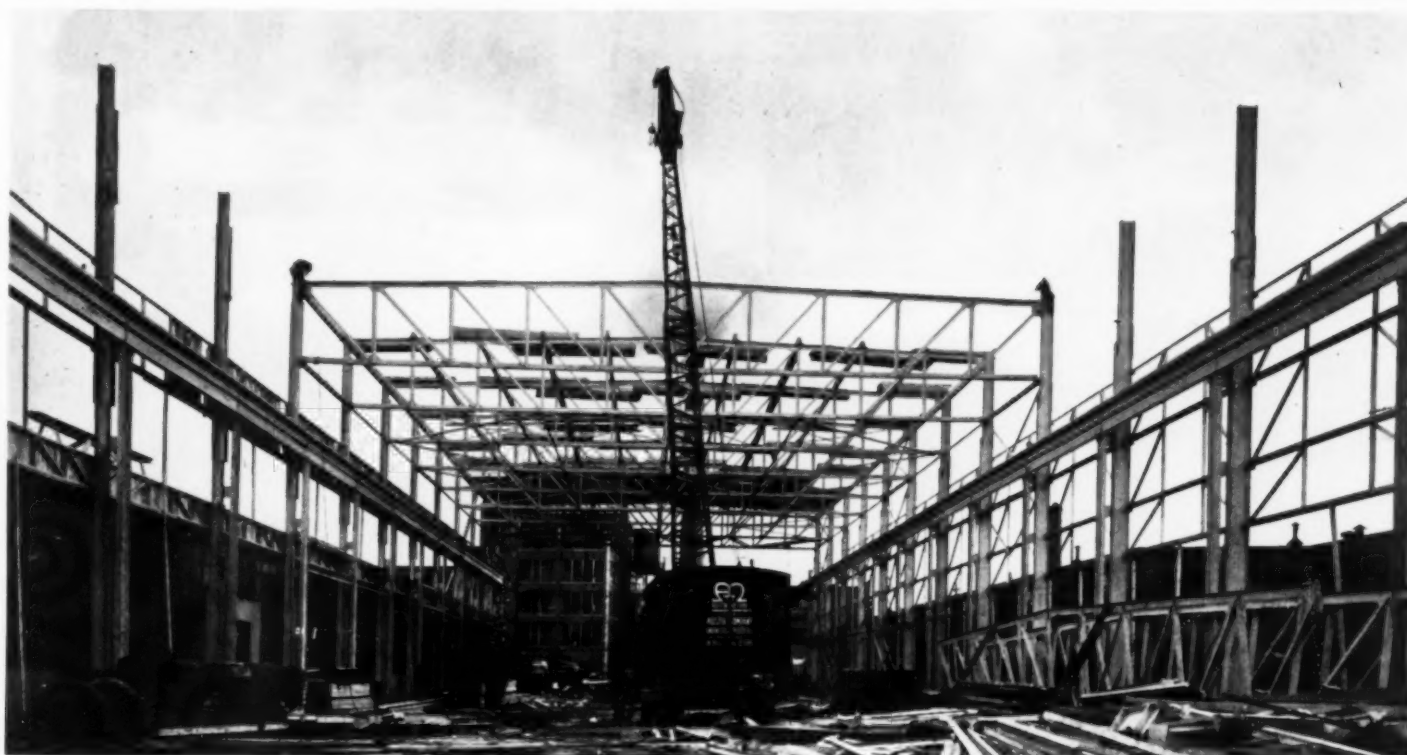
Construction Methods

ROBERT K. TOMLIN, Editor

Volume 24

AUGUST, 1943

Number 8



FRAMEWORK of Louisville war plant addition is constructed of salvaged wrought iron and steel refabricated for use in trusses, columns and other members.

Salvaged Metal

REFABRICATED TO BUILD WAR PLANT ADDITION

MORE THAN 100 TONS of wrought iron and an equal amount of steel was salvaged and refabricated for use in construction of the latest addition to Tube Turns' plant at Louisville, Ky. The metal was obtained from the recently razed Louisville postoffice. Designer and builder of the plant is The Austin Co., of Cleveland.

The wrought iron was used in the truss webbing, bracing, eave struts, girts, and stub columns, while the 43-ft. columns and top and bottom chords of the 80-ft. trusses were made from second-hand steel. All of the structural members were



welded in the Austin shops at Cleveland and have riveted field connections. The wrought iron, which was originally produced more than 70 years ago, was found to be practically free from rust. While fundamental characteristics of the material called for special precautions in the

design, the cross-section conforms in all respects to a modern welded structure.

The only new steel in the structure is the 60-lb. crane rail, for which a priority was issued. The building is 220 ft. long and has a clear span of 80 ft., with 35-ft. clearance below the trusses and 28 ft. below the crane runway. It is being equipped with a used 10-ton crane and inclosed with a wood roof and modern wood ventilating sash. With the WPB orders prohibiting the use of steel in war plant construction still in effect, obtaining salvaged steel and iron for the framework made this addition possible.



COMPETITORS FOR TITLE of champion woman welder start vertical test in Round 2 of first national contest at Ingalls Shipbuilding Corp. yard, Pascagoula, Miss. Winner was VERA ANDERSON, of Ingalls, who defeated HERMINA STRMISKA of Kaiser's Oregon Shipbuilding Co., of Portland, with a score of 15 min. 2 sec. for 2-ft. vertical weld and 9 min. 44 2 5 sec. for 110-ft. vertical weld.

LINCOLN ELECTRIC PHOTO

"BIG INCH" (below), world's largest and longest oil pipeline, has final section lowered into place at eastern terminus, near Phoenixville, Pa., July 19. Completed in 350 days at cost of \$95,000,000 by War Emergency Pipelines, Inc., welded steel line 24 in. in diameter will carry 300,000 bbl. of oil daily from Texas to East Coast. At Phoenixville, 1,388-mi. line divides, with one 20-in. pipe going to Philadelphia and another to Linden, N. J. Financed by Defense Plant Corp., pipeline is owned entirely by government. First oil is scheduled for delivery to New York Aug. 20. Huge valves in foreground will regulate flow to eastern refineries.

PRESS ASSOCIATION PHOTO

THIS MONTH'S NEWS REEL



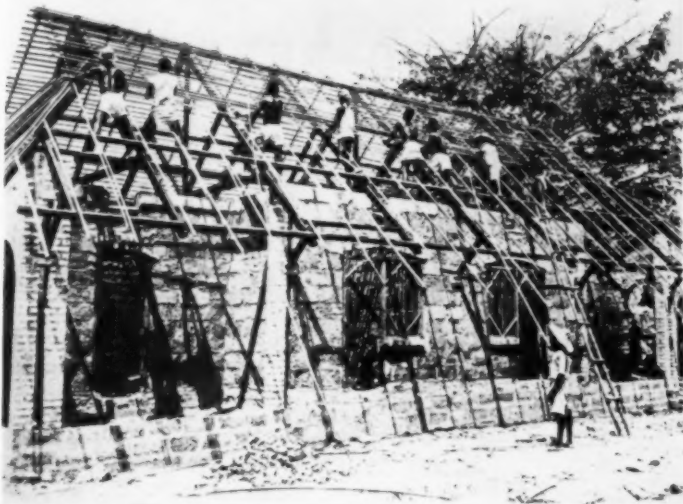
TWO-THIRDS MARK in concrete placement is passed June 15 at Norfolk Dam on North Fork River, tributary of White River in northern Arkansas, as Utah Construction Co. and Morrison-Knudsen Co., Inc., contractors for U. S. Engineers, deposit millionth yard in gravity structure 1/2 mi. long, with maximum height of 240 ft. from foundation to roadway on crest. Present at event are:

(Left to right) W. D. CROCKER, K. G. SHONS, L. F. SHERMAN, ROY HOUSE and CAPT. J. L. KEMPLE for U. S. Engineers; H. W. MORRISON, B. WILLIAMS, SI PIEDMONT, GEORGE PIEDMONT, H. P. O'HAGEN, J. H. REED and R. C. ARNOLD for contractors. Captain Kemple is resident engineer, and B. (Woody) Williams is project manager for dam construction.



WORKMEN SURFACE RUNWAY (below) for planes at U. S. air depot in India, while American officers inspect job. Runway construction and grading was



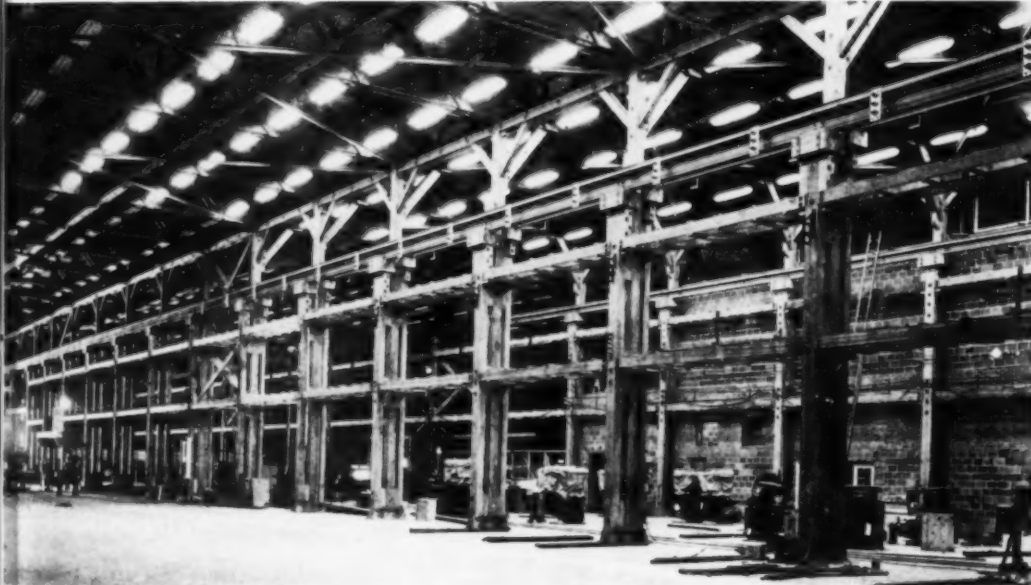


NIGERIAN GOVERNMENT sponsors construction of four-room house of two semi-detached cottages at Udi Siding, model village for miners. Main construction is of breeze blocks, with brick piers at veranda corners and brick arches. Thatch roof of palm leaf mats will be laid on bamboo strips, replacing corrugated iron which is now unavailable.

BRITISH COMBINE PHOTO



FIRST OF 26 CONCRETE BARGES is launched at Belair Shipyard, San Francisco Bay, Calif. Built by Barrett & Hilp for U. S. Maritime Commission, concrete barges will increase tonnage capacity without using steel plate needed for other types of wartime vessels. Each barge is 365 ft. long, with cargo-carrying capacity of about 5,000 deadweight tons.



FOUR-ACRE BLACKOUT PLANT is built of 1,554,000 b. ft. of lumber, with estimated saving of 1,920 tons of steel. One acre of pressed wood panels replaces window glass. Plant is operated by Westinghouse Electric & Mfg. Co. Contractors were Cummins Construction Co., of Baltimore, Md.



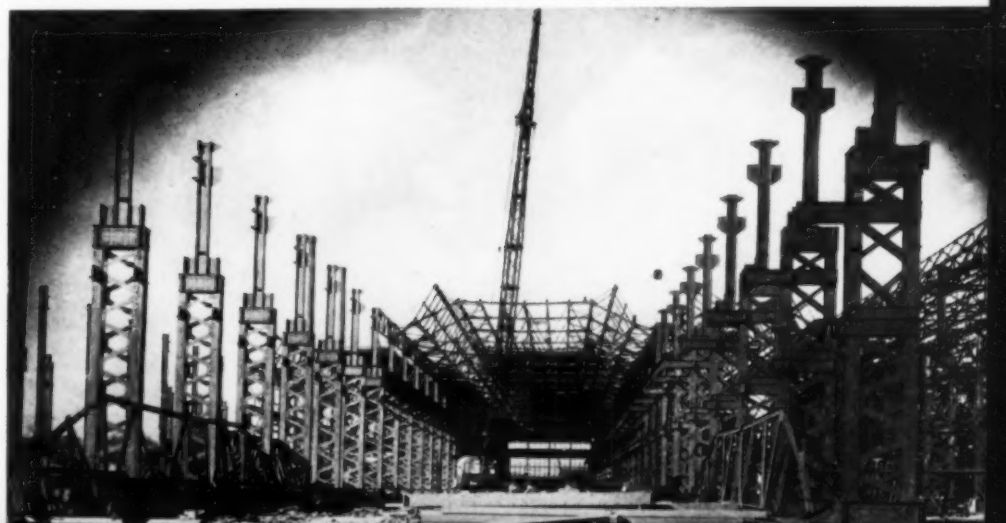
AFTER SURRENDER of Pantellaria, small, strategic island in Mediterranean between Tunisia and Sicily, bulldozer starts clearing away debris caused by bombardment.

BRITISH COMBINE PHOTO

done by Indian Army engineers and arrangements for construction were made possible through lend-lease set-up.

PRESS ASSOCIATION PHOTO

MAJOR ADVANCES in foundry construction are reflected in plant (below) built by Turner Construction Co., of New York, for U. S. Navy at Birdsboro, Pa. Main building comprises about 10 acres under one roof with overall height of 65 ft. It is of reinforced concrete and steel construction.



CONTRACTORS BUILD PLANTS TO PRODUCE

Synthetic Rubber

FOR FIGHTING FORCES AND HOME FRONT

By Vincent B. Smith

Associate Editor, Construction Methods

RAPID CONSTRUCTION

and early operation of synthetic rubber plants have given the Government a head start on its program of producing synthetic rubber at a rate of more than 750,000 long tons per year before the end of 1943. This program, reduced to meet the exigencies of war from the original figure of about 1,000,000 tons proposed in the Baruch committee report to the President, will supply all essential rubber requirements of the fighting forces and the home front, but it will provide nothing for non-essential uses.

Construction of the various component plants which contribute to the making of buna-S, the type of synthetic rubber on which the Government's whole tire program is based, has kept step with deliveries of process equipment and materials, and these deliveries have been made, in the main, on rapid, orderly schedules. Contractors on the plant projects have regulated the speed of construction operations to correspond with the equipment delivery schedules, and many of the jobs have been able to work 24 hr. a day, 7 days a week during periods of peak effort. Similar speed has been made on construction of plants for other types of synthetic rubber, such as butyl, which possesses special properties of great value for other purposes than tire manufacture.

Observations reported in these notes are based on visits to four plants to which admission was granted by the War Department and the Defense Plant Corp., the latter a unit of the Reconstruction

● This is the first of a series of articles, approved for publication by the War Department and the Office of the Rubber Director, telling how four typical plants were rushed to completion as part of the Government's program for producing synthetic rubber at a rate of more than 750,000 long tons per year before the end of 1943.



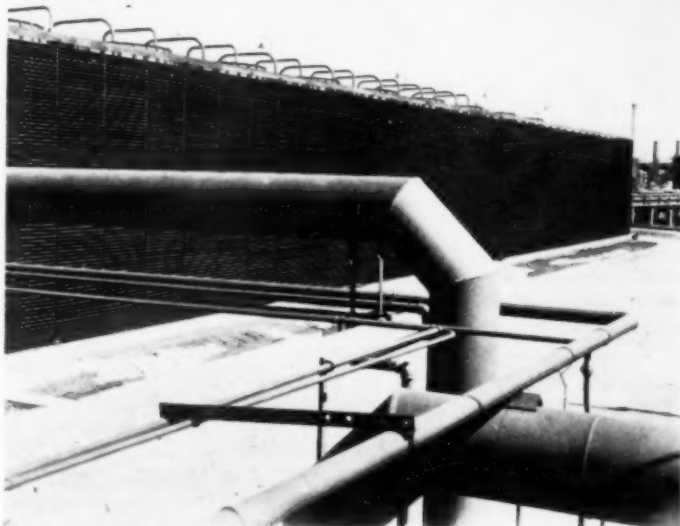
RUBBER DIRECTOR WILLIAM M. JEFFERS (in felt hat) makes trip of inspection to Monsanto Chemical Co.'s styrene plant at Texas City, Tex. In group with him atop 212-ft. distillation tower are (left to right): Operator JAMES R. DODDS, MR. JEFFERS, Supervisor MERRIL TYSON and COL. BRADLEY DEWEY, Deputy Rubber Director.

Finance Corp., of which the Rubber Reserve Co. also is a subsidiary. Under the top command of William M. Jeffers, rubber director, and his staff, the plants are built under the supervision of engineers of the Defense Plant Corp., which finances the projects. At each plant, all requisitions are signed by the supervising engineer for DPC.

Process design commonly, although not always, is by the company which is to operate the plant as the agent of the Rubber Reserve Co. The latter unit of RFC takes control of the completed plant in the role of owner and determines such important matters as general operating policies and the selling price of the product. The operating company manages and operates the plant as a fee contractor for the Government.

Conserving Critical Materials

Critical materials and critical equipment in large volume enter into the construction of synthetic rubber plants. Noteworthy readjustments of design have effected large savings in critical materials, both in structures and in process equipment. Although certain materials, such as stainless steel, considered best in normal equipment design, could be eliminated in places by using reliable substitutes, no substitutions were possible in many parts of the process lines. Similarly, no reduction could be made in the total volume of equipment necessary. The amount required placed a heavy demand on the facilities of manufacturers and fabricators.



REDWOOD COOLING TOWERS equipped at top with eleven Marley fans for induced-draft operation lower temperature of water for use as coolant in processing towers and other equipment of butadiene plant.



DISTILLATION TOWERS (below) ranging up to 90 ft. tall in foreground and to 105 ft. tall in background, where tower is still surrounded by temporary steel scaffold, are erected with 110-ft. gin poles. Note bents constructed of cast-in-place concrete supporting band of overhead process pipe and conduit along side of plant in foreground.



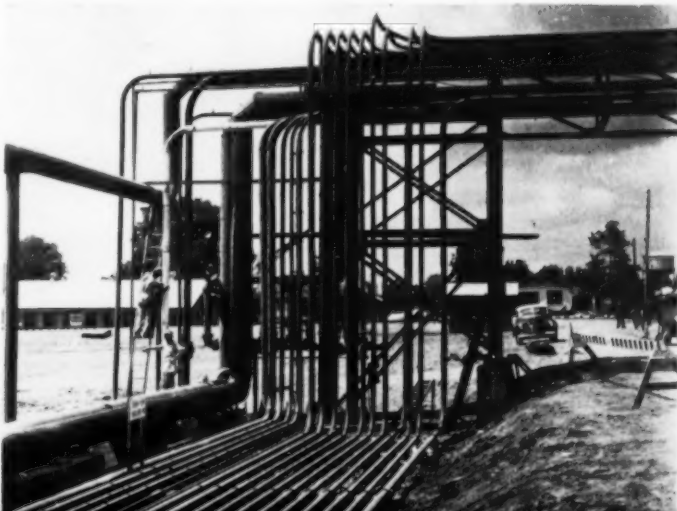
DISTILLATION EQUIPMENT comprises two quench towers and number of fractionating towers for feed stock and intermediate product. Dehydrogenation unit in this section converts butylene to butadiene, which then goes to extraction section to be extracted and purified. Note that all load-carrying steel is fireproofed with concrete.

FOUR-LEGGED LOCOMOTION (left) transports two men responsible for construction of butadiene plant by E. B. Badger & Sons Co., under contract with Defense Plant Corp. On pony at left is M. E. McMURRY, construction superintendent for contractor; mount at right carries W. T. HUFFMAN, assistant superintendent.

JOB ENGINEER (right) for E. B. Badger & Sons Co., contractor on butadiene plant, is D. B. EVANS.



INSULATION CREW (below) puts magnesia insulation on hot pipe of pipe band, which is elevated to cross road on steel truss bridge.



Buna-S bulks large in the Government program, as this synthetic rubber is to be used for all tire manufacture. Its name derives from the fact that it is a combination of butadiene and styrene. Another buna rubber, buna-N, also called perbunan, has not entered into the program, although the Standard Oil Co. of Louisiana, a subsidiary of Standard Oil Co. (New Jersey), has been making buna-N in a privately owned plant for two years. In this process butadiene reacts with acrylo-nitrile to produce buna-N. Patents on the buna-S process have been given to the Government by the Standard Oil Co. (New Jersey), which formerly owned them.

Chemical combination (copolymerization) of about 75 percent butadiene and 25 percent styrene, both of which are volatile liquids, results in eventual production of a synthetic rubber. The rubber manufacturer mills and compounds this product, adding a large percentage of carbon black and small percentages of sulphur and other ingredients, to make a compound which can be molded into tires or other useful articles.

To make buna-S, three separate proc-

ess units are necessary: a butadiene plant, a styrene plant and a copolymerization plant. In the Government program, these units often are operated by separate companies. Styrene plants, and butadiene plants as well, may ship to several copolymer plants at a distance. Butadiene units, whether operated by the copolymer company or a separate company, ordinarily are built in proximity to the copolymer plants for pipe delivery of butadiene. In the copolymer plant the rubber is made, washed, dried and pressed in bales weighing about 75 lb. each for packaging and shipment to the rubber manufacturer.

Constructors of Four Plants

This series of articles will describe a butadiene plant built by E. B. Badger & Sons Co., Boston, Mass., for operation by Standard Oil Co. of Louisiana; a styrene plant constructed by the Monsanto Chemical Co., St. Louis, with the Esslinger-Misch Co., Detroit, as prime subcontractor, to be operated by the Monsanto Chemical Co.; a copolymer plant

erected by the H. K. Ferguson Co., Cleveland, and the Blaw-Knox Co., Pittsburgh, under contract with the Firestone Tire & Rubber Co. for the Copolymer Corp., a corporation, owned and controlled by seven independent rubber manufacturers, smaller than the big four in the industry; and a butyl rubber plant, mentioned in the next paragraph. Operating control of copolymer plants by combinations of smaller, independent rubber manufacturers represents a move on the part of the Government to assure adequate supplies of synthetic rubber for use of these manufacturers during both war and peace. As an illustration of this purpose the Copolymer Corp. is made up of: (1) Armstrong Rubber Co., West Haven, Conn.; (2) Dayton Rubber Mfg. Co., Dayton, Ohio; (3) Lake Shore Tire & Rubber Co., Des Moines, Iowa; (4) Mansfield Tire & Rubber Co., Mansfield, Ohio; (5) Pennsylvania Rubber Co., Jeannette, Pa.; (6) Sears, Roebuck & Co., Chicago; (7) The Gates Rubber Co., Denver, Colo.

Butyl rubber is made by polymerization of isobutylene with a small amount of isoprene, and butyl rubber

New Butadiene Unit Involves Erection of 10,000

SEVERAL PIECES of new construction equipment, with capacities and characteristics well fitted to the work, assisted the E. B. Badger & Sons Co., general contractor, Boston, in completing in one year on a single-shift, 7-day week basis a new butadiene plant which required, along with other operations, the erection of 10,000 tons of metal in process facilities

and structures. The new government-owned plant, financed by the Defense Plant Corp. and constructed under the general supervision of its engineers, has about doubled butadiene output at Baton Rouge, La., by the Standard Oil Co. of Louisiana, which operates the completed unit for the Rubber Reserve Co. Rated capacity of the new plant is 15,000 long

tons a year. Butadiene has been produced by the Louisiana company at a privately owned plant for 20 months, at another company plant for 8 months, and at a third plant, owned jointly with the Government, for 5 months. Capacity greater than that already available was needed to furnish butadiene to a nearby copolymer plant manufacturing buna-S synthetic

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CONCRETE FOUNDATIONS (below) and underground utilities are installed during first stage of job, preparatory to erection of process equipment. Crawler cranes, seven of which are used during construction of plant, aid trench excavation and placing of pipe.

CONCRETE BUCKET (below) hung from 15-ft. jib on 80-ft. boom of crawler crane handles ready-mixed concrete into structure. Truck mixers haul concrete



plants are integrated, with units grouped in one property. The Standard Oil Co. of Louisiana is making butyl rubber in one such unit and will soon start production in two more plants on the same site, the latter pair delivering rubber slurry to a central finishing building where the rubber is dried and milled in sheets for shipment. All units of this coordinated plant, including the finishing section, were process-designed by the Standard Oil Development Co., another subsidiary of Standard Oil Co. (New Jersey), and were engineered and constructed by the Stone & Webster Engineering Corp. Butyl rubber is extremely useful for certain kinds of service, as it is a stable product which is relatively unaffected by exposure to free oxygen or acids.

Prefabrication Aids Progress

Prefabrication of process equipment plays an important part in speed of plant construction. Pressure vessels such as drums, heat exchangers and tall towers are shop-fabricated in complete units or in as large sections as shipment and erection will permit.

The miles of pipe required for each plant likewise are fabricated to the utmost extent possible by the manufacturers and are joined into the plant lines with a minimum of field connections, welded, flanged or expansion. Welding is extensively employed, most of it electric, with a minor amount of oxyacetylene. Vessels, some of them made of heavy plate to resist high pressures, are shop-fabricated with welded butt joints, and the same type of weld is used for pipe joints both in the shop and in the field.

Materials Substitutions

Substitutions were made for critical materials where the replacements could be effected without slowing the work or endangering the reliability of the plant. Structures originally designed in steel sometimes were built of that material only because rolled shapes could be procured and erected more quickly than a redesign in wood could be completed. Asbestos-cement pipe supplanted cast iron and steel for water mains up to 85- or 90-lb. pressure, although cast-iron

pipe continued to be used for high-pressure fire lines. Reinforced-concrete and brick construction, with timber roof trusses, replaced steel frames where possible in buildings; wooden platforms, stairs and ladders were used, where safe, instead of steel; and office buildings commonly were built of wood with asbestos-cement shingles or some similar material for siding and roofing.

Plant Costs and Rubber Prices

No exact figures can be given on the cost of erecting and equipping plants for production of synthetic rubber. For total cost of the three component units which enter into the making of buna-S, a figure commonly mentioned is \$1,000 per ton of annual production. During the present early stages of the synthetic rubber program, prices established by the Rubber Reserve Co. for buna-S have been in the range of 40 to 50c. a pound. Leaders in the rubber industry look forward to a possible selling price, when production costs are reduced by capacity.

(Continued on page 108)

Tons of Metal in Structures and Process Facilities

rubber. Butadiene supplies about 75 percent of the feed stock for the buna-S copolymer. Production by the new butadiene unit started in May.

Insistence by the contractor, particularly by the construction superintendent, resulted in the acquisition at the beginning of the job of two new Bucyrus-Erie diesel cranes, a 45-ton and a 30-ton. The

large crane, equipped with treads of extra width and length, proved especially valuable in handling and erecting heavy process equipment and structural materials. Only tall towers, going up 90 to 105 ft. above the ground, were beyond the reach of this machine, which carried an 80-ft. boom and a 15-ft. jib. Working at 27-ft. radius, the crane easily and

accurately set five 39-ton compressors on their anchor bolts without a slip. Three of the compressors were placed with the 80-ft. boom, and two were set with the boom shortened to 60 ft.

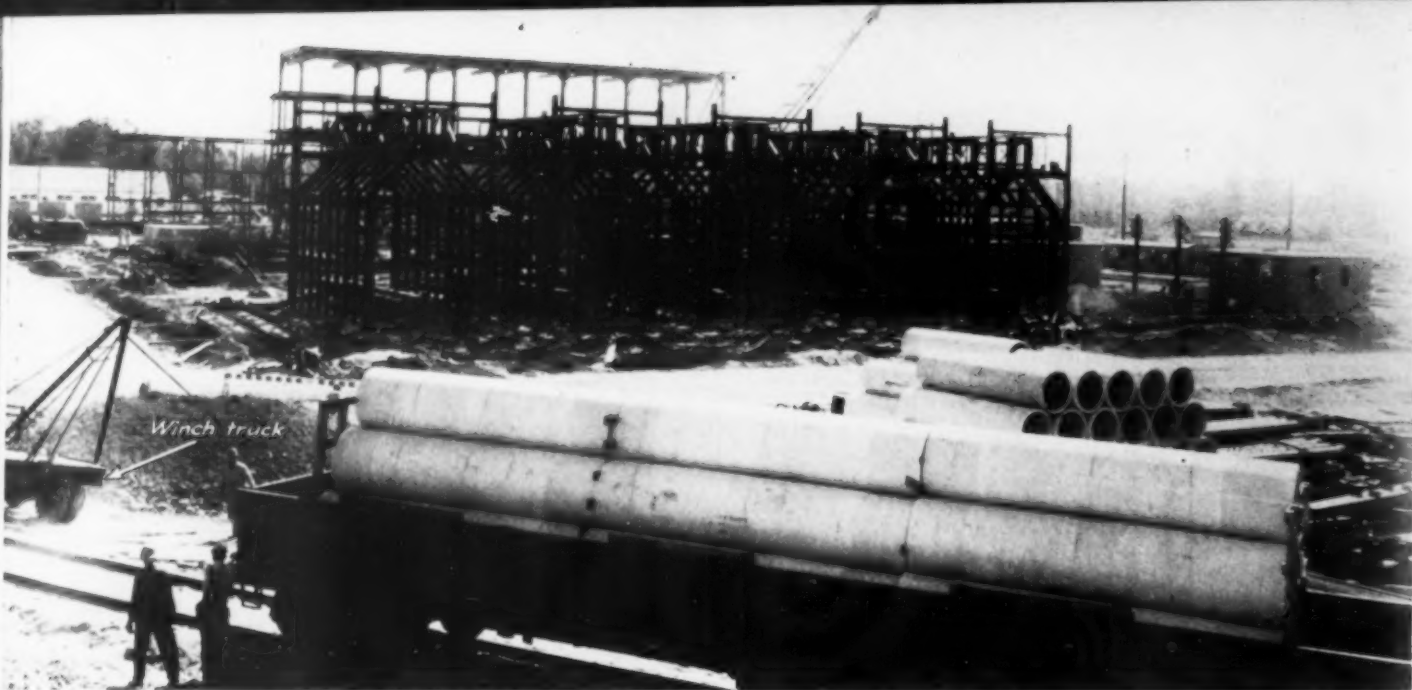
Supplementing the two new cranes were five aged veterans in various stages of debility. One of the five badly worn cranes was acquired by purchase from the

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from one permanent commercial plant and two temporary plants on nearby industrial jobs. Note forms for concrete bents below crane boom.

GIN POLES (below) assembled in heights up to 110 ft. are used to erect one distillation tower 105 ft. tall and several 90 ft. tall. Structural steel and process equipment at lesser heights are erected by long-boom crawler cranes of 45-ton and 30-ton capacity.





STRUCTURAL STEEL FRAMES for gas-fired superheater furnaces are erected in background. In foreground, winch truck pulls railroad car loaded with asbestos-cement pipe for service water lines.

Ordnance Department, and the other four were operated under rental agreements. Prior experience in attempting to build other rush jobs for war purposes with badly maintained machines of this kind led to the superintendent's determination to get hold of some adequate, dependable key units for the butadiene project. Two adjacent jobs were under construction simultaneously by the same contractor, and the cranes served all three projects.

Three new Ingersoll-Rand portable air compressors, two 500-cfm. and one 315-cfm., proved equally valuable in maintaining uninterrupted progress of job operations. For welding of process pipe lines and equipment at the speed required

by the construction schedule, thirty welding machines had to be kept in continuous operation, with sufficient reserve units to assure steady output by this number. Machines were acquired wherever they could be had, and welding work never was delayed by lack of equipment.

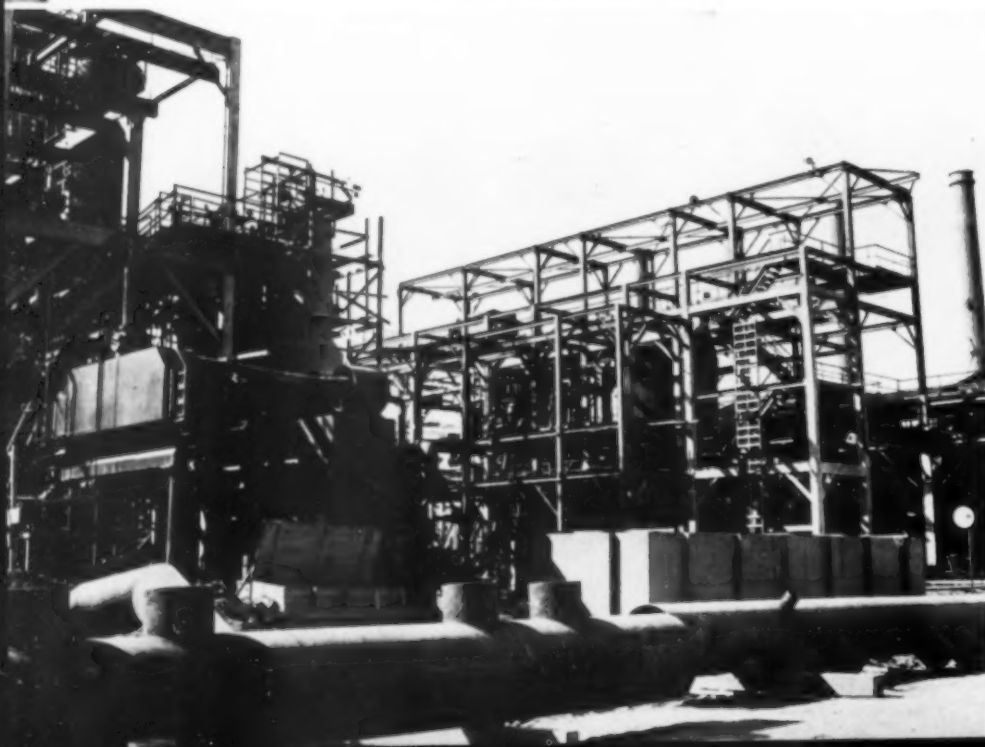
To erect tall distillation towers, several about 90 ft. high and one 105 ft. high, the contractor employed two 110-ft. gin poles. Although guy derricks capable of setting more than one tower from a single location are recognized as ideal equipment for erecting tall vertical vessels, the layout of the butadiene plant did not permit use of derricks.

Not too much information can be given

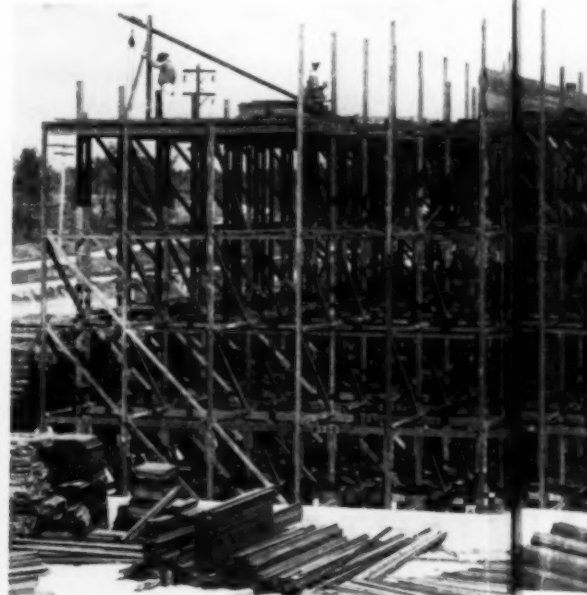
with respect to the butadiene process, as it, together with the other processes entering into the production of synthetic rubber, comes under strict secrecy orders. In the first stage of the process, butylenes (totaling four in number) are catalytically dehydrogenated in a dehydrogenation section. The product of the dehydrogenation section, consisting of butadiene and some other materials, is concentrated by distillation. A solvent extraction process then extracts the butadiene from the concentrate, and the extracted butadiene is purified by distillation, ready for storage or shipment.

This process of making butadiene by catalytic dehydrogenation of, butylene

LOAD-CARRYING MEMBERS (below) of structural steel frames are incased in fireproofing concrete. Shop-fabricated large-diameter tubing, shipped by rail to job, lies on timbers in foreground. Tubing in sizes larger than 24-in. is fabricated from steel plate, with longitudinal welded seams.



BOLTED REDWOOD FRAME for eleven-cell cooling tower is erected above concrete foundations. Large cooling water unit, including three 12,000-gpm.





SHOP-FABRICATED CURVED PLATES are welded into spherical tanks of 6,000-bbl. capacity for storage of feed stock, intermediate stock and finished butadiene, which is piped from storage area to nearly copolymer plant making synthetic rubber.

originated with the Standard Oil Development Co., a subsidiary of the Standard Oil Co. (New Jersey). It is being employed in the bulk of the Government's butadiene program. The extraction and purification process used in the new plant is another achievement of the Standard Oil Development Co., and this process also is being utilized for a large part of the program. Taken together, the new unit represents the first completed plant of a type which will produce butadiene for 40 percent of the synthetic rubber program. The plant makes butadiene from a refinery gas, butane normal.

A quite different process for making butadiene by straight cracking of oil is

employed in the first butadiene plant of the Louisiana company, started many months before Pearl Harbor. This unit, which went into production in Jan. 1942, a month after the declaration of war, was the first full-size oil cracking plant designed to produce butadiene.

With a rated capacity of 15,000 long tons a year, the new plant practically equals the total production of the other previously completed butadiene plants in the same locality. The entire group of butadiene plants represents an investment of \$12,050,600 by the Standard Oil Co. of Louisiana and \$11,507,000 by the Government, a total of \$23,557,600. On the basis of a production of 30,000 long

tons a year, this gross figure would give a plant cost of about \$785 per ton.

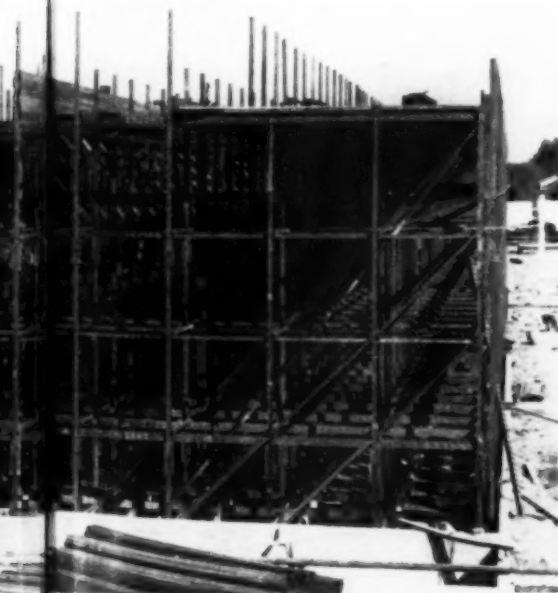
For the butadiene plant, tank farm and intermediate areas, J. W. Carruth, subcontractor, Baton Rouge, La., graded a site of 25 acres with tractor-scrappers, bulldozers, draglines, trucks and sheeps-foot rollers. The maximum fill was about 10 ft., and the deepest cut was 6 or 7 ft.

Soil at the site is a heavy clay which becomes sticky and gummy when wet. In undisturbed condition, the clay is an excellent bearing material for foundations, and all structures of the butadiene plant rest on reinforced-concrete footings designed for 4,000-lb. per sq. ft. loading.

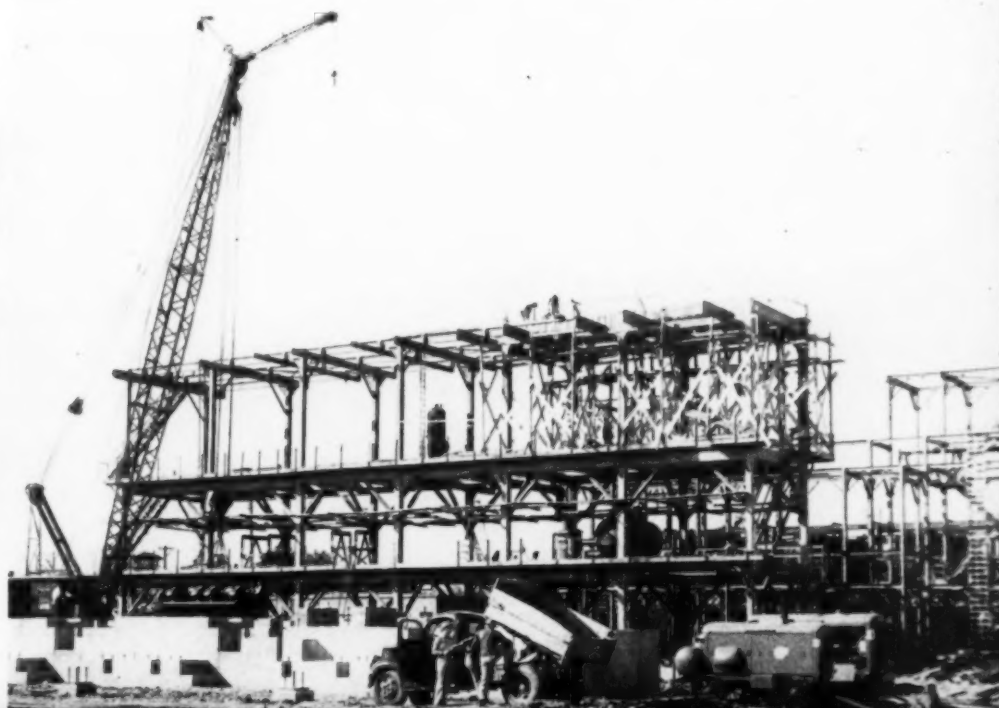
(Continued on page 112)

pumps, is needed to supply cooling medium to distillation towers, compressors and condensers of butadiene plant.

45-TON-CAPACITY CRANE (below), equipped with crawlers of extra length and width for additional stability, sets permanent equipment units in position on anchor bolts protruding from concrete pedestals. Portable compressors, in foreground, supply air for pneumatic tools.



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Army Engineers Demonstrate *Combat Technique*

By ROBERT K. TOMLIN
Editor, Construction Methods

IN CROSSING BARBED WIRE entanglement large, heavy member of combat Engineer unit makes fat dive (above) to land upon and depress strands. His body, in prone position (below) serves as stepping stone for troops advancing behind him.

SIGNAL CORPS PHOTOS



BARBED WIRE ENTANGLEMENT (below) is speedily set up on metal stakes with helical ends for screwing into ground. Heavy gloves protect hands of soldiers. Soldier at right unwinds reel of barbed wire.



BOTH TECHNICAL SKILL and combat tactics were demonstrated at Pelham Bay Park, New York, July 24 and 25, when a detail of 250 Army Engineers staged a series of maneuvers to acquaint the public with the wide range of Engineer activities in modern warfare and to stimulate the current campaign to recruit 100,000 mechanical, technical and construction specialists needed by the Corps of Engineers for service in theatres of war overseas. The troop demonstration and an exhibit of Engineer equipment were presented under the direction of Brig. Gen. B. C. Dunn, North Atlantic Division Engineer.

The program of Army Engineers in



PONTON BRIDGE is built (left) on air-inflated rubber floats. Heavy truck is run out on completed structure and is ferried across lagoon (right) by attaching outboard motors.

action included the staging of a sniper's ambush, examples of the use of camouflage, the laying and clearing of a mine field, erection and crossing of barbed wire entanglements, building of sections of ponton bridges of two types and, as a stirring climax, an attack on a fortified position, involving the use of machine gun and artillery fire, hand grenades, flame throwers and the placing and detonation of charges of high explosives. In addition, the show illustrated the operation of a mobile map-reproduction train comprising seven truck-trailer units, one of them carrying a fully-equipped lithograph press capable of running off 6,000 sheets per hour. Various types of light and heavy construction equipment, including tractors, scrapers, graders, bulldozers, heavy-duty trucks, air compressors, welders, pumps, and saws were also on display. Certain units of these types are of modified sizes designed to be flown to points of use in airplanes or gliders.

Mine-laying Operation

Many of the troops, comprising combat, aviation and camouflage units, were clad in the Army Engineers' latest camouflage uniforms, mottled green, brown and black coveralls that blended with the local terrain to reduce the visibility of their wearers. One of the first tasks performed was the mining of a field to impede an enemy advance. From a motor truck the mines, in the form of flat tin cans, were distributed, laid out in an irregular pattern to prevent the safe passage of an enemy tank or truck, and sunk in shallow holes, dug by hand shovel, and covered over with sods originally removed from the shallow pits. All earth shoveled from the holes was carefully placed in canvas bags and removed to prevent detection of the mine field by enemy aerial photographs, in which freshly dug earth shows up clearly.

A sequel to the mine-laying operation was the task of detecting an enemy mine field and rendering it harmless. This task was performed by a line of combat engineers, crawling forward side by side on their bellies and probing the ground

(Continued on page 98)

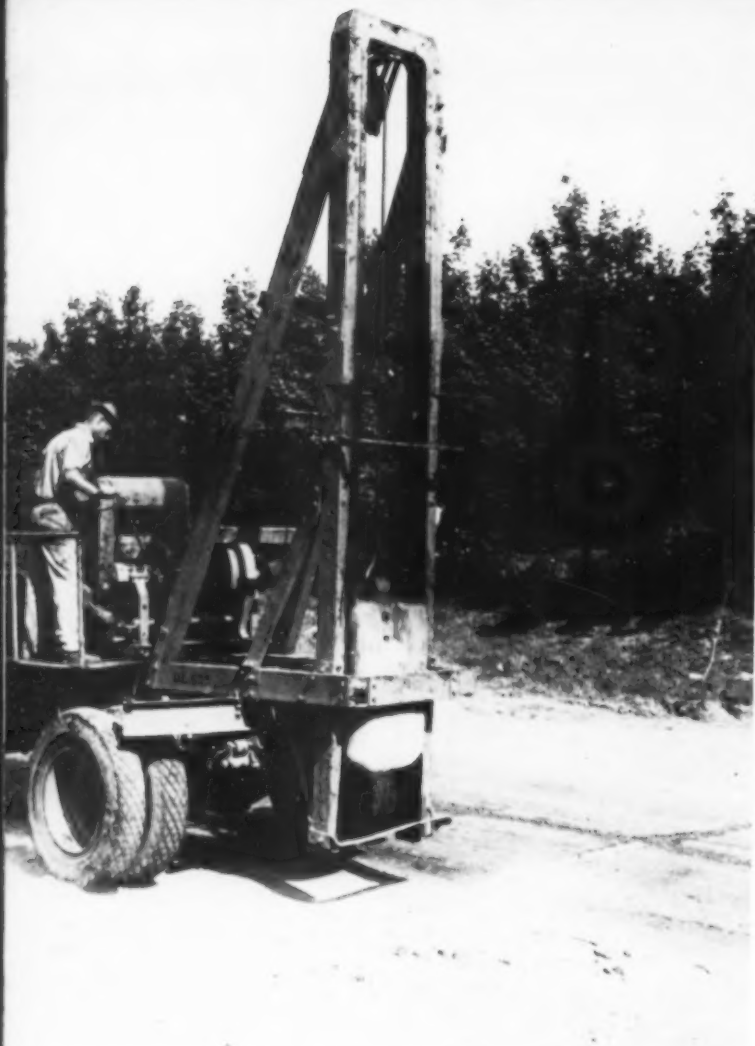


IN MOTTLED CAMOUFLAGE SUITS blending with background, combat Engineers pop up from concealed position in field to open fire during surprise attack.

CAMOUFLAGE (below) is one of the important responsibilities of Engineer units. Here a gun position is concealed from enemy air observation by a net interwoven with strips of colored cloth to blend with terrain and prevent casting of shadows.

SIGNAL CORPS PHOTO





DROP-HAMMER PAVEMENT BREAKER aids maintenance of Illinois Division of Highways. Trip hammer, with 6- to 8-in.-diameter face, is mounted on rotating bed on rear of truck which permits it to swing through 180 deg., striking about 100 blows per min. and breaking old pavement into one-man sizes. Unit is used with portable air compressor and pneumatic breaker for outlining areas to be patched, breaking concrete in patch corners and trimming edges.

FOR SHAKING SIEVE to screen sand, Ingersoll-Rand sand rammer (below), with tamping head removed, is mounted in horizontal position on tripod and attached to sieve, to which rapid reciprocal motion is transmitted when compressed air is turned on to operate tool. Sieve is hung from pair of hinged metal straps to provide for reciprocating movement.



ASPHALT DISTRIBUTOR heats concrete mixing water in transit to paver and during waiting period at mixer during winter construction of Army Fighter Command base. Water is pumped from distributor to mixer by small pump dragged on sled.

HOW

They Did It

CONSTRUCTION DETAILS

For Superintendents and Foremen

LEVER JACKS and pipe rollers (below) move three large coal-fired heating and ventilating boilers into boiler house of new plant recently completed by Turner Construction Co., general contractor, for SKF Industries, Inc., at Gwynedd, Pa. Delivery and installation of completely assembled boilers save several weeks' time in completing plant.



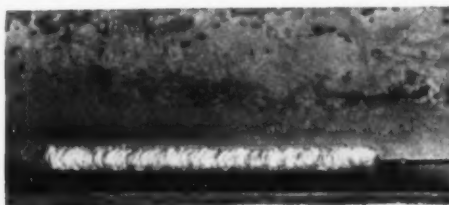


HEAVY DEW AND RAIN is dried off steel plates prior to welding or painting at Richmond shipyard No. 1 in California by tools developed by **FRANK YEFFA** (above), quartermaster in charge of pipe maintenance, and **DARRELL S. VICTOR**, burner (below), of Permanente Metals Corp. shipyard. Both dryers burn natural gas with compressed air forced draft and both avoid waste of oxyacetylene, formerly used to dry plates.

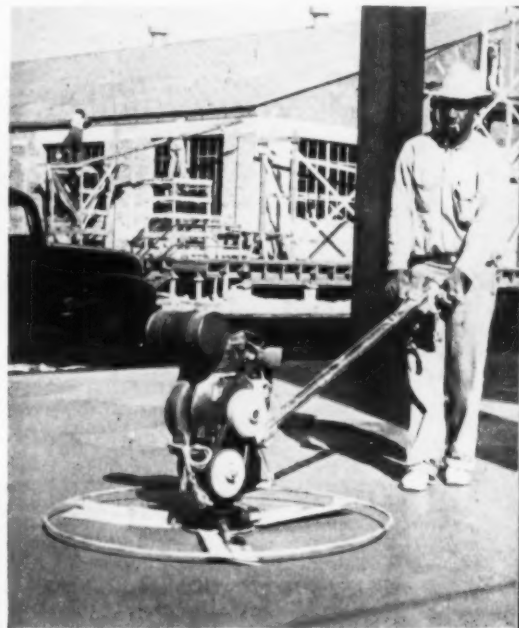
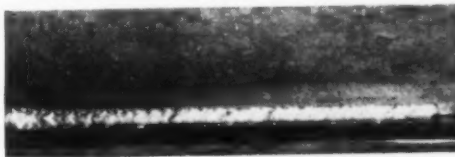
Fore 'n' Aft
Richmond Shipyards Photos



TWO-WAY RAMPS of steel plates bridge fine grading equipment on access highway construction project in South. Ramps fastened to grader move along as it proceeds without digging into subgrade but close enough to permit trucks to go over easily. Grader is thus held up only momentarily, and batch trucks are able to use subgrade, thereby avoiding opening up new road for truck haulage.



TWO FILLET WELDS, each produced in 1 min. with General Electric equipment, show how use of larger electrodes increases production speed. Weld (above), 5 3/4 in. long, was produced with 3 16-in. electrode, while weld (below), 10 in. long, was produced with 1/4-in. electrode.



FINISHING OF CONCRETE FLOORS of machine shop at yards of St. Johns River Shipbuilding Co., Jacksonville, Fla., is done with Whiteman gasoline-powered machine equipped with three rotating trowels and operated by one man. Under direction of U. S. Maritime Commission, yard was built by Thompson-Starrett Co., of New York, for production of Liberty freighters.

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CONTINUOUS OPERATION of 6-yd. Bucyrus-Monaghan dragline (below), taking gravel from river bottom is accomplished by use of portable overhead loading hopper equipped with air-operated sliding doors, under which Euclid bottom-dump wagons are spotted. With loading time reduced to minimum, average load taken from river bottom and hauled to screening plant by each wagon is 15 cu. yd.

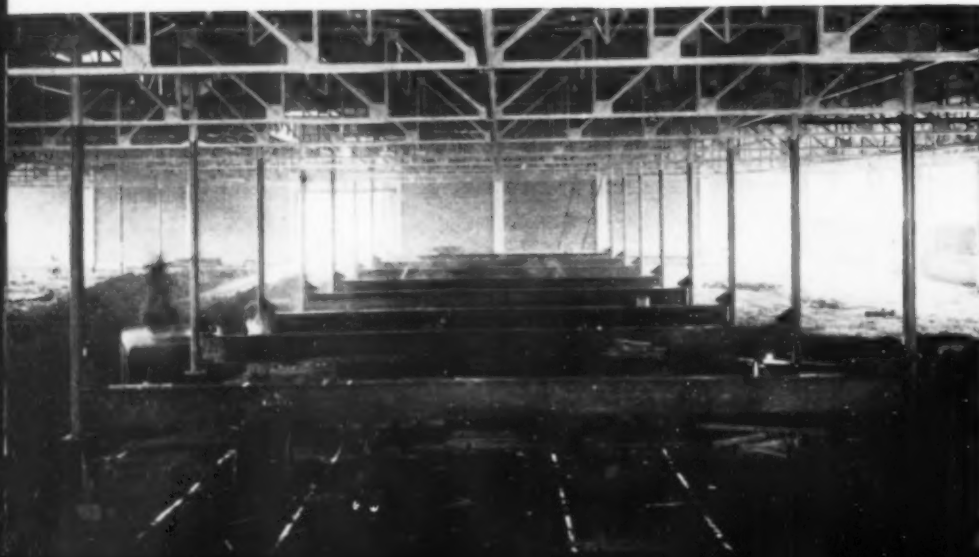




SUSPENDED IN MIDAIR from ends of needle-beams by brackets, columns support load of building while power shovel excavates earth for basement. Material stands at steep slope, allowing shovel to make deep undercut along line of columns.

Long I-Beam Needles Provide *Cantilever Support* For Columns While Basement Is Dug Under Completed Factory

A REVERSAL OF THE NORMAL SEQUENCE OF OPERATIONS in constructing a factory building for the Federal Telephone & Radio Corp. at Clifton, N. J., was made necessary when it was decided, in order to accommodate a change in manufacturing procedure, to provide a basement, not included in the original plans, after the structure had been practically completed. The final stage of the work, therefore, presented this unusual sight: as the finished roofing was being applied, excavation for the basement was begun, after Spencer, White & Prentis, Inc., underpinning and foundation specialists, of New York, in cooperation with the Turner Construction Co., the general contractor, had devised and installed an ingenious system of cantilever I-beam needles for supporting the columns of the structure while a power shovel excavated the earth beneath them to the new basement floor level, 10½ ft. below ground floor grade. The methods employed made it possible to dig out the basement and extend the columns to concrete footings at a new and deeper level without delaying the operations of the



COLUMN SUPPORT (left) during excavation of basement is provided by series of 24-in., 100-lb. steel I-beam needles resting on blocking laid on earth floor of factory building. Brackets welded to columns transfer loads to cantilevered ends of I-beams, allowing column bases to be undercut.

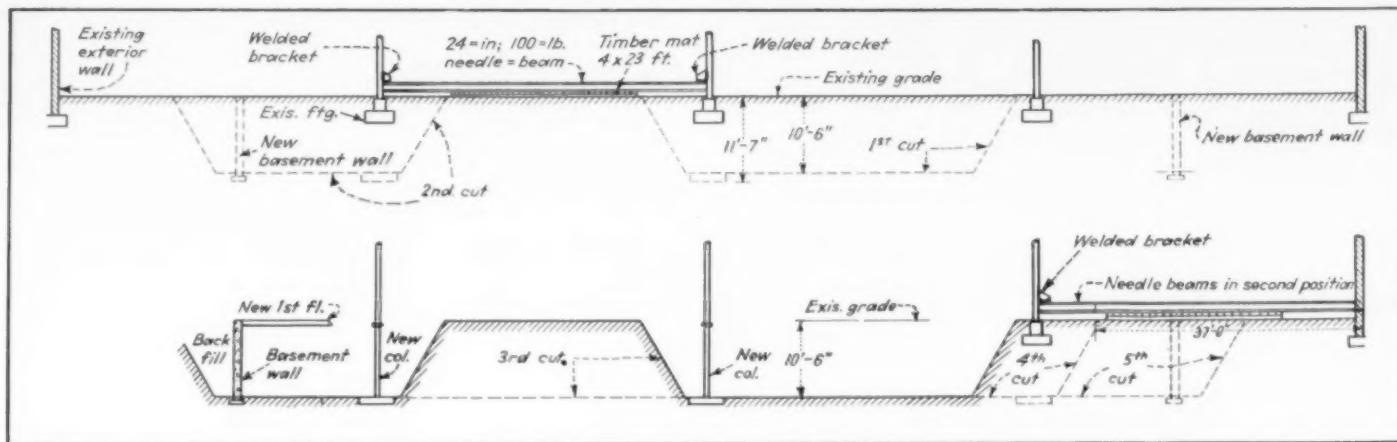
Turner Construction Co. in completing the superstructure.

The building occupies a ground area of 426x185 ft. and is one story in height, except for a two-story portion 200x20 ft. in plan along one side. The insulated concrete plank roof is carried by light steel trusses supported by three rows of Lally concrete-filled 7½-in. O.D. steel pipe columns 21 ft. high and spaced 46 ft. on centers across and 23 ft. lengthwise of the building. These columns have bases of 1-ft. square steel billets secured by anchor bolts to 4-ft. square concrete footings. In the area over the basement there are a total of 24 columns located in three longitudinal rows of eight each. The building is inclosed by brick bearing walls that carry the ends of the roof trusses extending from the outer rows of columns. Each column carries a dead load of about 20 tons.

For the new basement it was necessary to excavate an area of 132x180 ft. to a depth of about 11 ft. below the floor level, involving the removal of 10,000 cu.



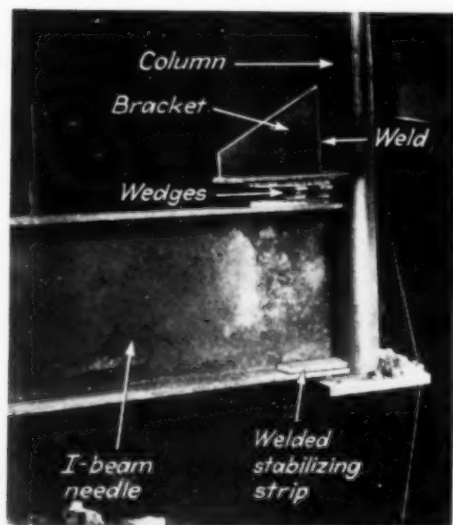
WITH CUT COMPLETED to basement grade in foreground area, two columns, (at left) are extended to new and deeper concrete piers by bolting new 10½-ft. sections to their bases to carry building load. I-beam needles for these first two columns have been removed and shovel is starting to excavate earth prism which served to support I-beams on timber mats. In background other needle-beams are still in place.



FIVE CUTS are made by power shovel, as indicated in sketch above, to remove material from basement after columns have been underpinned with I-beam needles. After first and second cuts, columns in two rows are extended to new footings, needle-beams are removed, and earth prism between columns is excavated by third cut. Needle-beams are transferred to support final row of columns at right and remaining earth is excavated by fourth and fifth cuts.

Page 63

TO AVOID DANGER (below) of shovel working too close to extended columns, bulldozer, at right, pushes earth down within reach of dipper.



BRACKET IS WELDED to side of column and is wedged against top flange of cantilevered I-beam needle to transfer load of building as supporting earth is excavated by power shovel. Bracket is formed to gusset shape by cutting piece from 15-in. I-beam. Between lower flange of needle-beam and column is welded steel stabilizing strip.





yd. of earth, and to provide support for the columns while a 1-yd. power shovel, aided by a tractor-bulldozer, dug the material from beneath them. The method adopted involved the following steps, illustrated in the accompanying diagram and photographs.

Column Support

Across the bay of the factory building formed by two longitudinal rows of columns 46 ft. apart there are placed on timber mats laid on the earth floor eight 24-in., 100-lb. steel I-beam needles, one I-beam extending transversely between each pair of the 16 columns, with a clearance of a fraction of an inch at each end. On each column, a few feet above its base, is welded a bracket consisting of a short length of 15-in. I-beam cut in the form of a gusset plate and positioned with its lower flange forming a horizontal arm 1½ ft. long and a few inches above the top flange of the 24-in. I-beam needle. The connection between bracket and column consists of a ¾-in. fillet weld 14½ in. long along the web of the bracket and a ½-in. horizontal weld between the flange of the bracket and the cylindrical column surface. Between the lower flange of the needle-beam and the column is welded a steel stabilizing strip.

The timber mats upon which the 24-in. needle-beams rest horizontally are 4 ft. wide and 23 ft. long and consist either of two layers of 3x12-in. planking and filler blocks, laid criss-cross on a leveling course of sand, or 12x12-in. transverse blocking on a single layer of planks. The ends of these load-distributing timber mats are about 11 ft. distant from the columns.

After the long needle-beams have been set on their timber mats the column loads at each end are transferred from their concrete footings to the ends of the horizontal needle-beams by inserting steel plates and driving wedges under the column brackets until the columns are lifted about ¼ in. When all of the sixteen columns in two rows running lengthwise of the building have been thus needed, a 1-yd. power shovel makes two cuts to basement grade, as illustrated in the accompanying diagram, one cut along each side of the underpinned bay of the building. The shovel undercuts the column footings, leaving the columns

(Continued on page 119)



CUT IS MADE by power shovel for full length of basement along row of eight needed columns at left. Earth excavation is loaded into trucks reaching ground level by ramp.

CONSTRUCTION PERSONNEL on project includes **JOSEPH C. WEAVER** (right) general superintendent and **DOMINICK CANALE** (left) foreman, for Spencer, White & Prentiss, Inc., underpinning contractors, and **WALTER P. JACKSON** (center) project superintendent for Turner Construction Co., general contractor.



FINAL SINGLE ROW OF COLUMNS is needed by Ibeams wedged under brackets at one end and anchored at other end in niche cut in brick masonry wall of building.

Page 64

POOSH 'EM UP, TONY describes this example of earth-moving teamwork. When tractor-bulldozer, shoving earth to shovel between columns, had hard time backing up steep slope (below, left) shovel operator deftly maneuvered dipper to engage bulldozer blade (below, right) and by crowding boom helped machine climb to top of bank.



Air Tool Adapted to Vibrate Concrete for Ships

By P. O. EGNER
Egner Bros., Houston, Texas

From a paper which won third prize
in the Compressed Air in Industry Contest sponsored by the
Compressed Air Institute of New York

FOR VIBRATORY WOOD FORMS containing freshly poured concrete for ship construction, a long-stroke chipping hammer, operated by compressed air, was adapted with the aid of certain changes and special attachments.

Because of the curvature of the ship's sides and the weblike structure of steel reinforcing rods, there was no possibility of using the conventional type of internal vibrators. The builders, therefore, sought some way to settle the concrete through external vibration. We first thought of using an electric vibrator, of which there are several types on the market, but the unavailability of the correct current put an end to that idea.

Compressors were everywhere on the scene, and we hit upon the idea of using compressed air. For a tool I tried a long-stroke chipping hammer. I soon found that, though this tool had no variable throttle on it, I could vary the speed and the weight of the blows by inserting trigger-stops in the trigger slot.

The next problem was to design a tool which would not mar the wooden forms, which had to be used time and time again. The logical answer was to head the tool with a butt of rubber hard enough to resist great wear, while transmitting a man-sized shock, yet soft enough to cushion the blow so that the wooden fibres would not be crushed. I finally chose a firm rubber classified as U. S. Rubber 7882.

The next problem was the proper cement to bond the rubber butt to the steel disk so that the incessant blows would not cause the rubber to come loose or slide off. A cement known as drum ce-

ment, used by floor men to cement the rubber pads to the drums of floor sanding machines, had the desired qualities.

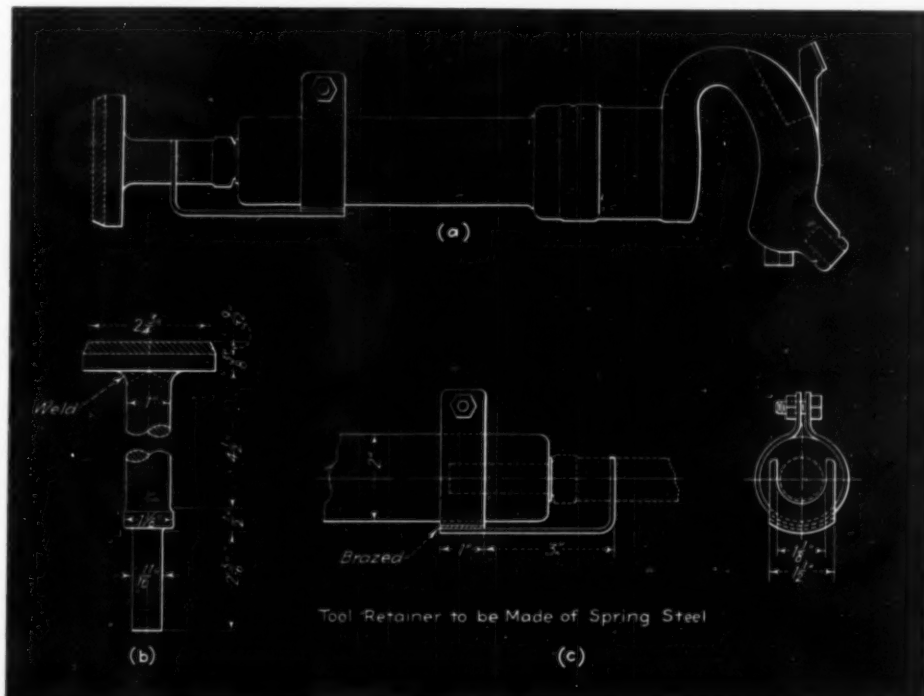
To keep the tool in the chipping hammer and still permit the operator to carry out his duties efficiently, a tool-holder was constructed of a straight piece of

strap iron fastened around the barrel and held in place by a bolt, and a strip of spring steel slotted at one end to fit around the shank of the tool and brazed to the iron strap at the other. The device is dimensioned so as to let the tool operate freely, without permitting it to drop from the barrel. This device, of course, is not absolutely necessary where the operator is working at waist or chest level, but will be found very convenient where work must be done at low or high levels and in places where the operator is in a strained position.

Cost of Unit

The cost of an outfit for this pneumatic external vibrating is not excessive. The largest expense is the chipping hammer, \$60. Care should be taken to see that the hammer has a long stroke. Small, fast-hitting hammers are not suited to the job. The vibrating head can be manufactured in small quantities for about \$5 each; for large quantities the cost would naturally decrease. The tool holder can be made for about \$3 in small lots. A single unit would, therefore, have an installation cost of approximately \$68.

Using the vibrators in pairs, with one on either side of the form, gives the most efficient results. In my case, the form was of varying length but only 8 to 10 in. in width. Workmen started at the bottom and vibrated the concrete as it was poured. It was found that this method of vibration was particularly desirable since it produced a fine textured finish in the concrete next to the form, thus increasing its water resistance.



(A) STEEL DISK welded to standard tool blank, forms tool for vibrating concrete with air-operated chipping hammer. (B) SLIGHT BEVEL on rubber butt heading tool prevents edges from breaking and splitting away. (C) TOOL RETAINER of spring steel keeps tool in chipping hammer, while permitting operator to function efficiently when work is at very high or low levels.

FIVE CONSTRUCTION BRANCHES IN TEXAS



INDUSTRIAL CONSTRUCTION such as that represented by this plant on Houston Ship Channel is expected to furnish large volume of post-war work for architects, engineers, contractors, materials suppliers and building trades unions in Houston area. Tellepsen Construction Co. is contractor for job shown.

By VINCENT B. SMITH

Associate Editor

Construction Methods

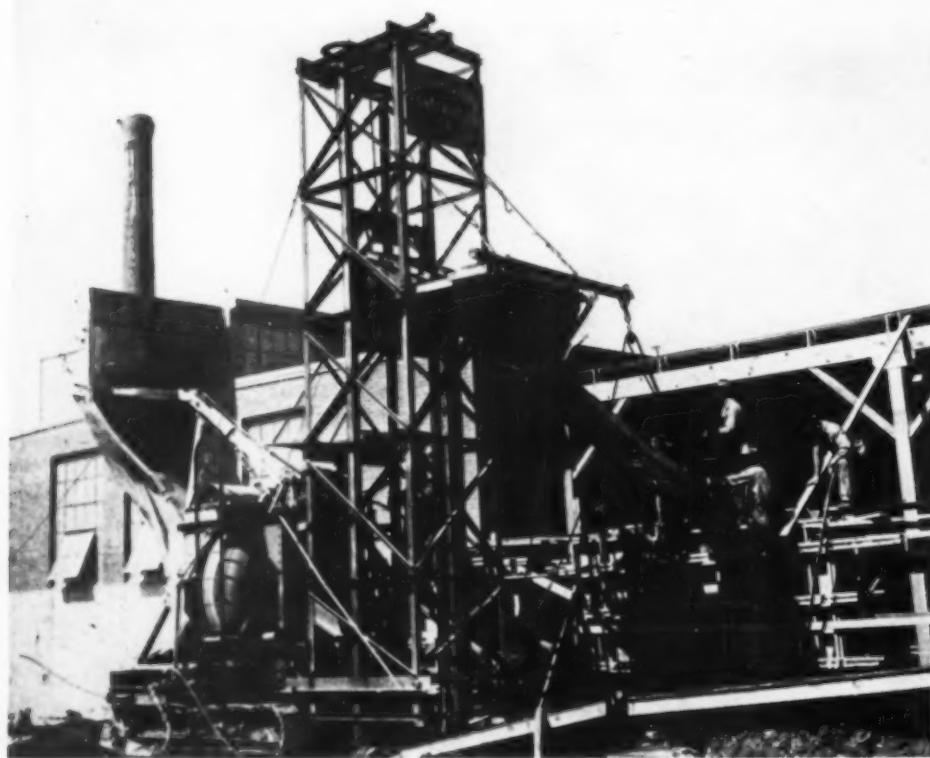
IN CONTRAST TO THE SPIRIT of mutual indifference which retards cooperative effort by various branches of the construction industry in some localities, the architects, engineers, contractors, materials suppliers and building trades unions of Houston, Texas, are collaborating in the work of promoting advance preparation of plans and specifications by public agencies for post-war construction.

Through their two local chapters of the AIA and AGC, the architects and the contractors began the good work by naming men to sit on a coordinating committee which was rapidly enlarged to represent the broad interests of the entire construction industry in fostering proper pre-planning of post-war public works. Although conceived with a particular view toward stimulating advance study and planning of needed, useful public works, the committee's efforts already are generating a parallel effect by inspiring increased activity of chapter members and associated construction interests to develop on the part of their clients and customers a true conception of the meaning and value of complete pre-planning now for post-war construction.

Origin of Committee

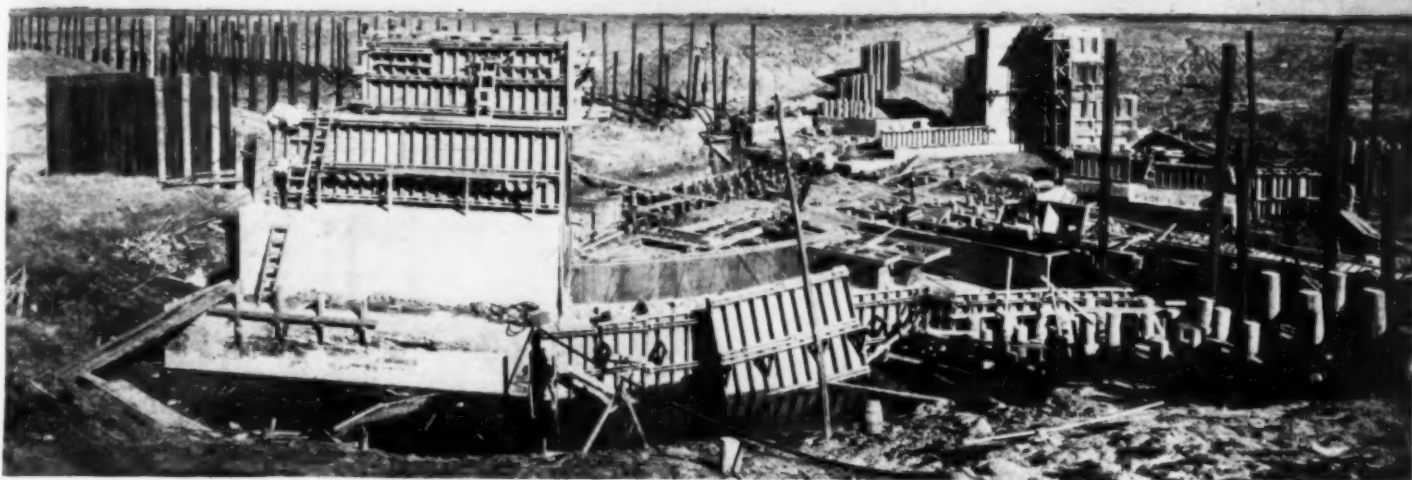
Originally set up as a five-man committee consisting of three appointed members from the South Texas Chapter of the American Institute of Architects and two from the Houston Chapter of the Associated General Contractors, the committee was quickly expanded to include two representatives from the Houston Engineers Club, one from the Producers' Council Club of Houston and one from the Houston Building Trades Council. Even before these groups were represented directly on the committee they had been invited to attend all committee meetings, and they had responded by giving wholehearted cooperation and support to the committee's program. From the beginning, the advice and suggestions of all these groups were requested by the original committee before any important decisions were made.

Credit for originating and developing the collaborative committee goes to the South Texas Chapter of the AIA. With-



STEEL PLANT costing \$20,000,000, first large mill of its kind in this area, foreshadows continued future growth of Houston industries. Tower-paver outfit places concrete in wall forms for Southwestern Construction Co., contractor, member of Houston AGC Chapter.

KAS COLLABORATE ON *Post-War Plans*



PUBLIC WORKS are first item in program of joint committee to stimulate pre-planning for post-war construction. Here flood gates are being constructed for protection of water-way by Tellepsen Construction Co., member of Houston AGC chapter, under direction of U. S. Engineers.

out being unduly laudatory, it can be said that the conception of a broad committee embracing all elements of the construction industry grew out of the unselfish thinking of the architects, who put professional and industry considerations ahead of any purely personal interests in developing the idea for co-operative action. As discussed originally by a committee of three appointed by the architects' chapter, the program required the collective thought and action of all groups who participate in construction. Furthermore, and this purpose was not entirely unselfish, the added influence of larger groups would lend needed weight in promoting plans advocated by the committee.

As one of its first steps, the architects' three-man committee called a meeting with invited representatives interested in post-war planning from the chamber of commerce, the City of Houston, the city planning commission, Harris County and the local groups of contractors, engineers and materials supply houses. This gathering was a "talking meeting"; it demonstrated that all groups represented there were intensely interested in development of sound plans for the period immediately following the war.

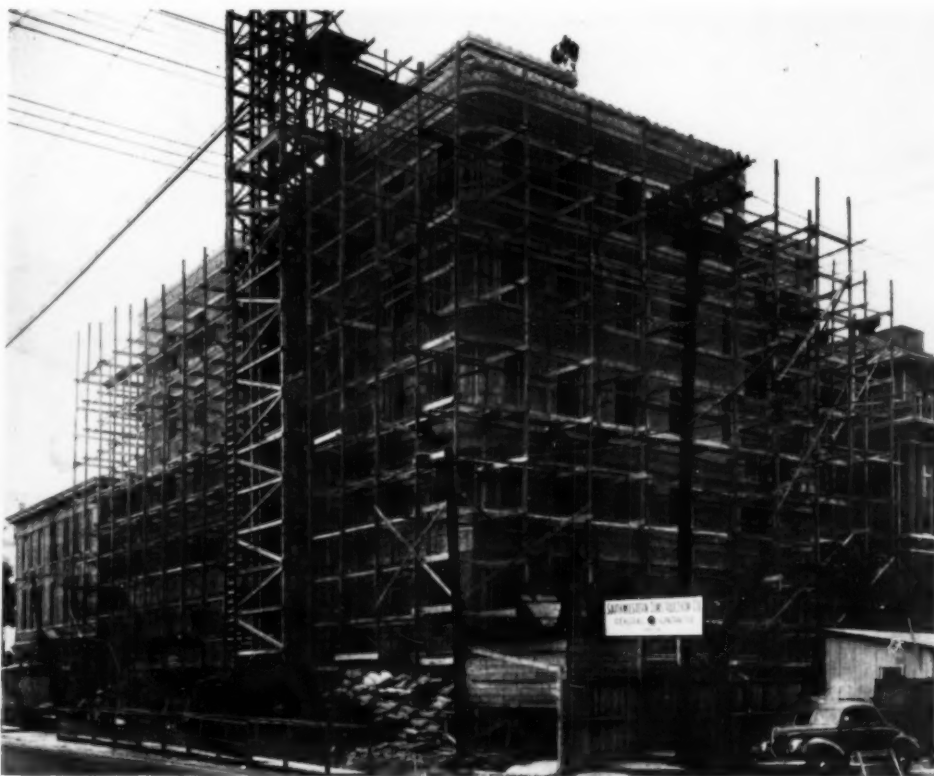
Soon after this meeting, and partly as a result of it, the committee was enlarged to take in two appointed members from the AGC Chapter. The expanded committee included the three original architect members: Thomas K. Fitz-Patrick, chairman, professor of architecture, Rice Institute, Houston, and two practicing architects, Alfred C. Finn and Eugene Werlin; and two contractor members: W. S. Bellows, of the W. S. Bellows Construction Co., and Robert W. Collins, of the Southwestern Construction Co. Serving as ex-officio members were Milton B. McGinty, president of the AIA Chapter, and E. A. Kruse, of the Tellep-

sen Construction Co., president of the AGC Chapter.

Additions made soon afterward increased the size of the five-man committee to nine members. The added representatives are Robert J. Cummins and W. W. McClendon, from the Houston Engineers Club; James A. Walsh, from the Producers' Council Club of Houston, and B. F. McClellan, president, Building

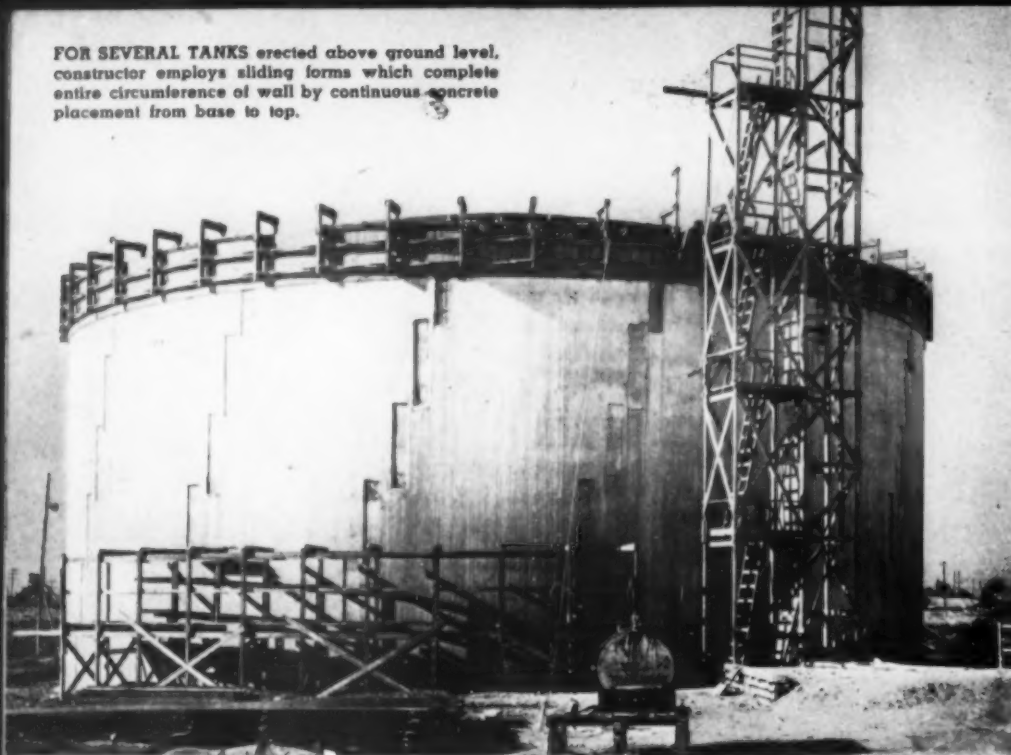
and Construction Trades Council of Houston and Vicinity. The Houston Engineers Club includes all branches of engineering (civil, chemical, electrical and mechanical), but the two committee representatives appointed by the club are both civil engineers, representing the branch that has the largest stake in construction.

(Continued on page 122)



LARGE PROGRAM of building construction for medical centers, hospitals, educational institutions and city schools is in prospect for Houston as soon as materials can be released. Hospital wing shown here was built by Southwestern Construction Co., Houston.

FOR SEVERAL TANKS erected above ground level, constructor employs sliding forms which complete entire circumference of wall by continuous concrete placement from base to top.



U. S. NAVY OFFICIAL PHOTO

Navy Saves Steel Plate

By Building for Fuel Storage

Prestressed Concrete Tanks

NOT TO CONSERVE STEEL IN GENERAL but to save steel plate in particular, the Bureau of Yards and Docks of the Navy Department has designed and constructed prestressed concrete fuel storage tanks in various capacities from 600 to 60,000 bbl. at many fuel depots. For purposes of concealment and protection, the tanks are nearly all buried under earth backfill sufficient to make them immune to any shock except a direct hit by an aerial bomb or naval shell. Although the amount of steel that goes into a prestressed concrete tank is roughly about half of that required for an all-steel tank, the prestressed concrete design eliminates entirely the use of steel plate, now much in demand for ships and armored land battlewagons. Steel-mill capacity for the production of bars and rods is not so greatly overtaxed, and these shapes can be utilized for reinforcing and prestressing concrete tanks without detracting from the main war effort.

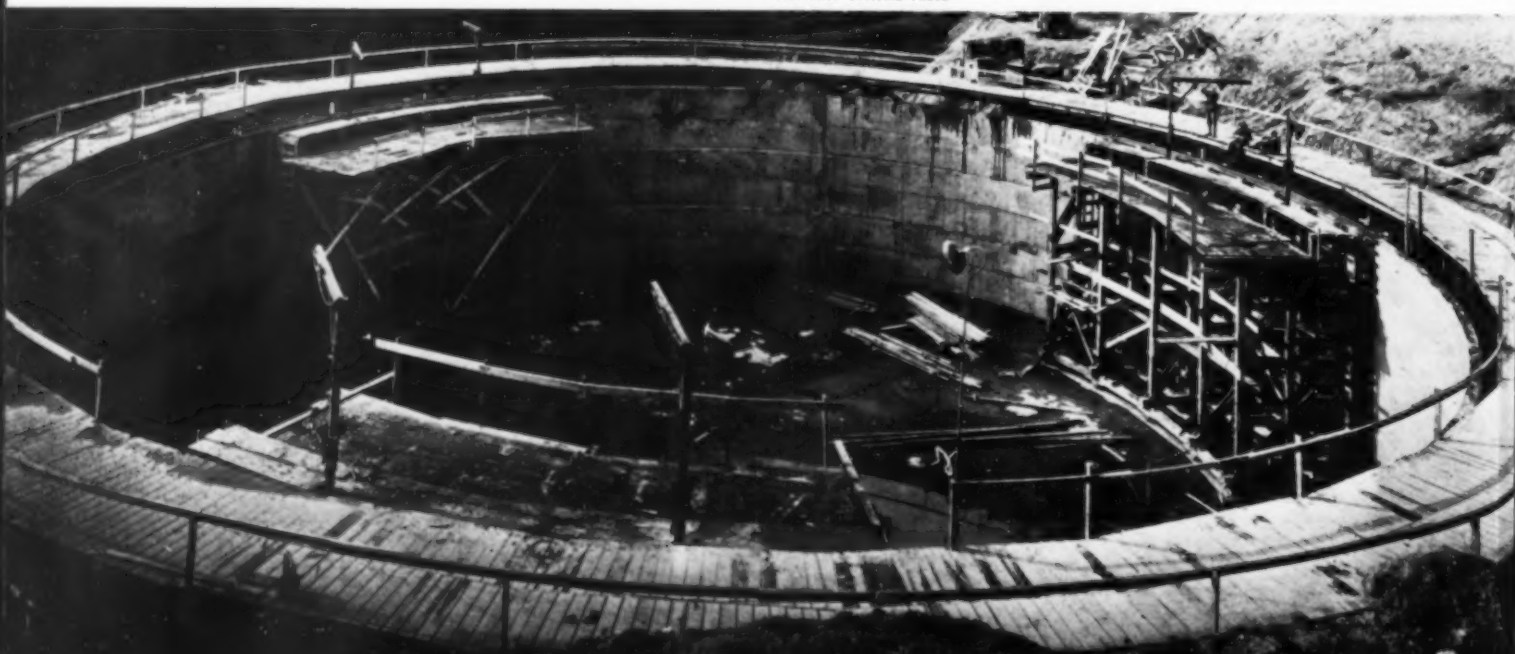
Tank Building Procedure

Construction contractors working under fixed-fee agreements have built prestressed concrete fuel storage tanks for the Navy at a number of points along the coastline of the United States. Under the usual construction procedure, reinforced-concrete floor slabs of the tanks first are completed by conventional methods, and the tank walls are then concreted to full height to eliminate any horizontal construction joints. Circumferential steel rods are placed later around the tank walls and are tightened to put a compressive stress into the concrete walls of the empty tanks.

Tank walls (ordinarily about 12 in. thick) usually are divided for construction purposes into an even number of equal sections separated by vertical construction joints. Half of the wall is com-

JUMBO FORMS (below) moved over floor slab are used by West Coast contractor to form inner surface of wall sections concreted to full height between vertical construction joints.

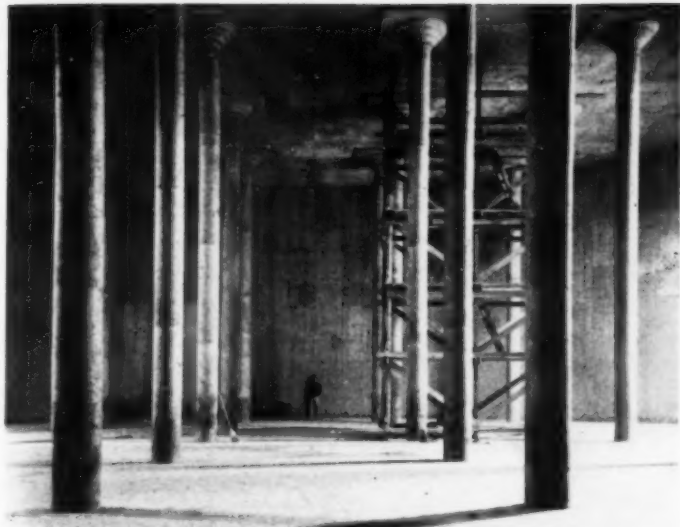
U. S. NAVY OFFICIAL PHOTO



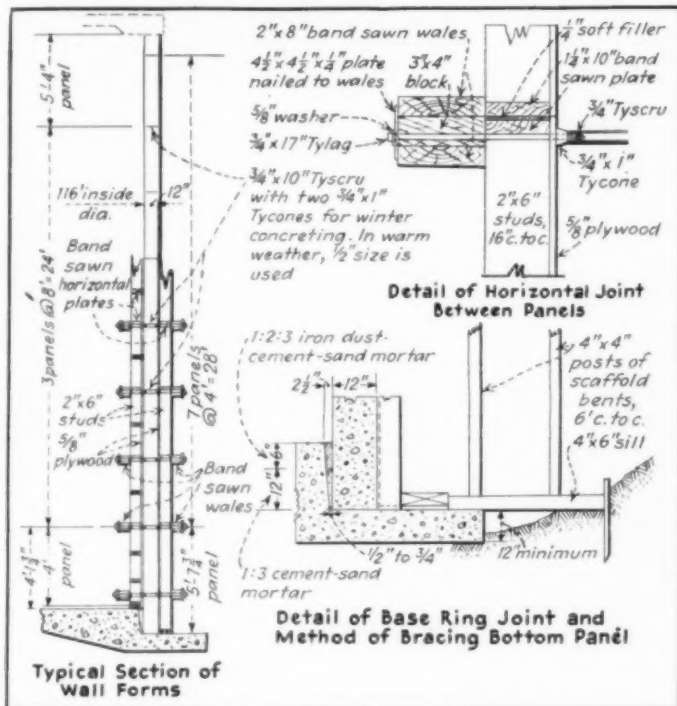
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CONCRETE CATHEDRAL of cylindrical shape 116 ft. in diameter, with clear height of 34 ft. from floor to ceiling, provides 60,000-bbl. capacity for fuel storage. Exposed concrete is to be lined with four sprayed applications of silicate of soda solution to resist attack of fuel oil.

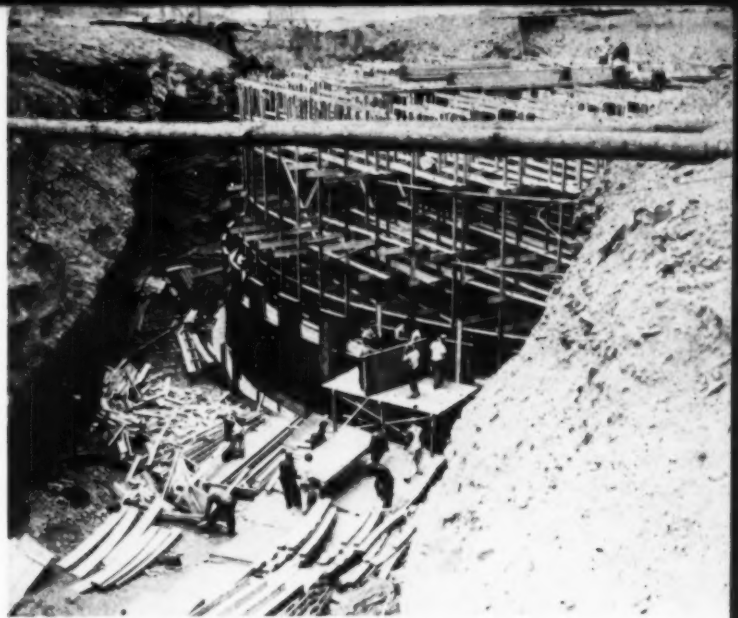


WALL FORMS for cylindrical concrete tank consist of plywood panels braced from interior temporary centering (not shown) which supports roof deck form panels. Wall forms for inner surface of entire wall are erected first, with form ties in place, and exterior forms are placed later in 4-ft. lifts, to which concrete is delivered through flexible pipe from hopper at edge of roof deck. Concrete crew completes four of eight wall sections to full height on one day, and remaining four alternate sections on another day.



TRUCK-MIXER (right) delivers concrete to portable hopper for distribution by hand carts to roof slab on top of completed wall and columns.

U. S. NAVY OFFICIAL PHOTO



BRACED FROM TEMPORARY CENTERING, inner wall panels of 4x8-ft. size are erected with long dimension vertical and horizontal joints staggered.

U. S. NAVY OFFICIAL PHOTO



INNER WALL FORMS are erected to full height, with form ties in place, and roof panels are laid on centering to provide working platform for distribution of concrete by hand carts. Forms for thickened edge of roof, resting on wall, will be placed later, after wall has been concreted.

U. S. NAVY OFFICIAL PHOTO



OIL... from the Land of the Midnight Sun



The tractor-sleigh supply convoy followed the path shown above — from the railhead at Peace River, Alberta, to Norman Wells, N. W. T. — approximately 1,000 miles. The Canol oil pipeline extends from Fort Norman to Whitehorse, to connect with the Alcan Highway.

IN the frozen wilds near the Arctic Circle, a treasure of oil lay sleeping . . . serving man but little purpose. Construction of the Alaskan Highway lifeline brought it within easy piping and trucking distance of our armed outposts. But before the precious fluid could be started on its way, thousands of tons of supplies for drilling, pumping and transporting had to be hauled over mountain terrain through the bitter cold of an Arctic winter.

With the last railhead a thousand miles below . . . and roads non-existent or non-passable . . . moving the materials there was a job for tractors — tracklayers that travel where ordinary forms of mobile power cannot penetrate.

Working with contractors Bechtel-Price-Callahan, the U. S. Ordnance and the Corps of Engineers outfitted tractor-sleigh trains. Over a hundred Allis-Chalmers,

2-Cycle Diesel tractors took up the long trek northward. Days and nights on end they fought their way forward . . . in temperatures that reached 70 degrees below zero. Traveling in convoys of four trains each — a tractor to each train — they made a continuous parade over the snow-packed tractor trails — a parade without fanfare . . . grim, determined and successful! They and their brave band of operators delivered the goods!

In the days after the war, more trails will be broken . . . to new riches. Tractors will pioneer the way where man has never yet set foot. They will deliver the goods against all odds . . . play their part in releasing the abundance of materials we need to make this a better, happier life. New roads will open up a new world for all — new places to see, new friends to make, new products to enjoy.

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That this venture was a man-sized job is evidenced by the Help Wanted warning sign posted by Bechtel-Price-Callahan, contractors. Known as the Canol Project, it was a joint U. S. Army and contractor undertaking.



118 ALLIS-CHALMERS, 2-CYCLE DIESEL TRACTORS, with their cargo-laden sleighs of oil rigs, pumps, pipe, tools and other oil field supplies, have written history in the snows of Canada's Northwest Territories. Additional A-C tractors also served, on various construction phases of the project.



ALLIS-CHALMERS
TRACTOR DIVISION, MILWAUKEE, WIS., U. S. A.

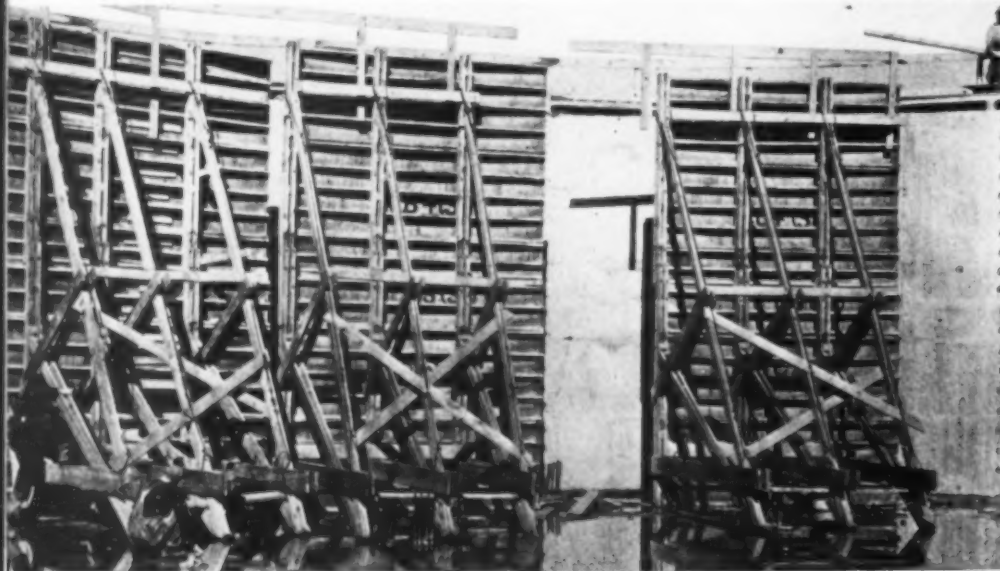




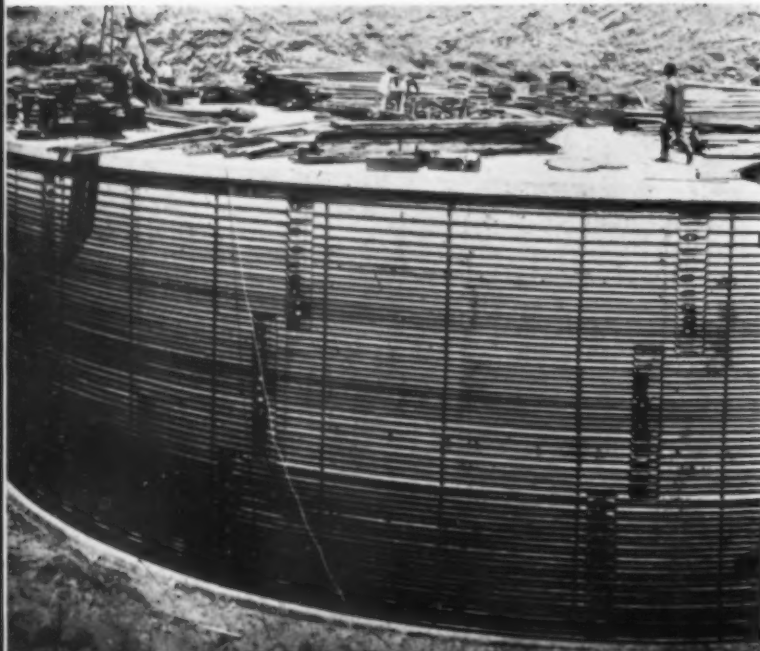
ALONGSIDE 60,000-BBL. CONCRETE TANK which has been completed to stage where circumferential band rods can be applied, crane weighing 120 tons, swinging 80-ft. boom, handles 2 1/4-yd. Insley buckets of truck-mixed concrete into wall forms of pumping and heating shaft. On bank at right are a concrete bell-and-spigot pipe used in drainage trench around edge of footing.

PORTABLE FORM UNITS, joined together to provide inside surface for section of tank wall, serve contractor on job in Southeastern state.

U. S. NAVY OFFICIAL PHOTO



U. S. NAVY OFFICIAL PHOTO



PRESTRESSED BAND RODS (left) have been tightened on this West Coast tank. Note where recesses for turnbuckles offset slightly at various levels; offsets are used on some tanks, not on all. Turnbuckle connections are staggered on alternate rods.

pleted in one day by placing concrete in alternate sections, and the gaps are filled a day or two later, after a normal lapse of 36 hr. to allow shrinkage of the concrete in the first sections. On one job, the contractor built the complete circumferential wall to full height by continuous concrete placement in slip forms.

Forms for Tank Walls

For walls built in sections, two methods have been employed, as indicated by accompanying photographs. Some contractors have utilized mobile jumbo forms, traveling on the floor slabs, for the inner surface of the wall. An alternative method, used on a number of contracts, has employed portable plywood panel forms for both the inner and outer wall surfaces. On these jobs, the entire inner surface for a tank wall is formed first, the form wales being braced from centering erected in the interior of the tank to support the roof deck. Under this procedure, the deck forms provide a working platform for distribution of concrete to the wall sections.

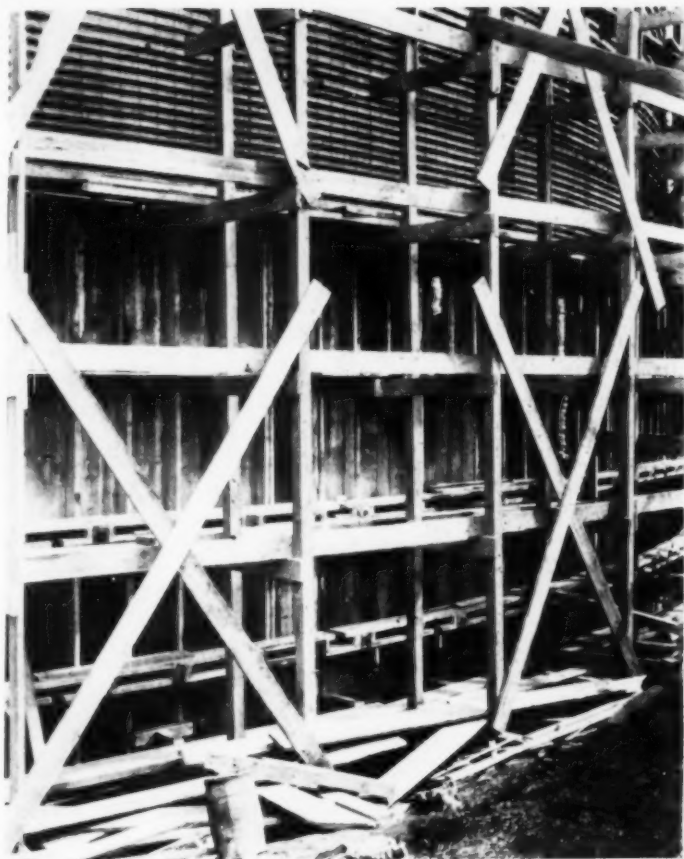
To save excavation and provide shock resistance, the tanks are covered with flat-slab drop-panel roofs supported by interior columns with flared capitals. Depending upon the kind of liquid fuel to be stored in the tank, exposed interior concrete is protected by a sprayed coating or sheet lining of inert material which does not react with the contained fuel.

How One Contractor Builds Tanks

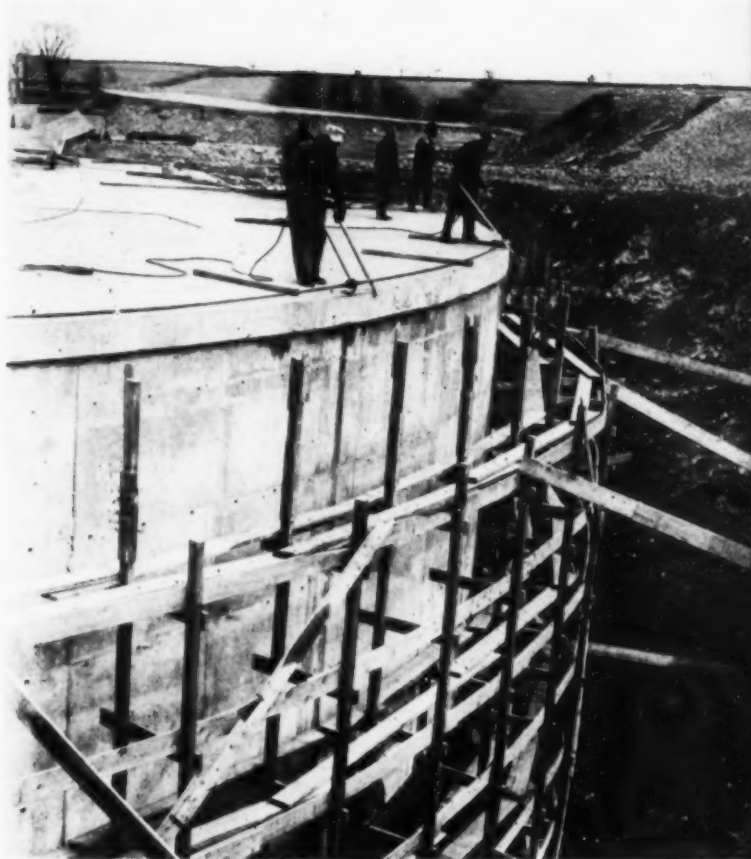
Methods of applying and prestressing circumferential steel band rods surrounding the concrete walls of the tanks are subject to some variation but are fairly uniform. The operations are illustrated by several photographs taken on (Continued on page 124)

REQUISITE NUMBER OF TURNS (below) for prestressing band rod is given to turnbuckle by workman using 4-ft. lever bar. Pipe wrench grips rod at one side of turnbuckle during tightening. Note hammer in background tapping rod being tightened. Similar tightening is taking place simultaneously at diametrically opposite turnbuckle.





PLYWOOD PANEL FORMS erected in 4-ft. lifts and fastened to form ties in concrete wall provide outer surface for 4-in. incasement of sand-cement grout placed over band rods. Wire-mesh temperature reinforcement has been attached to band rods.



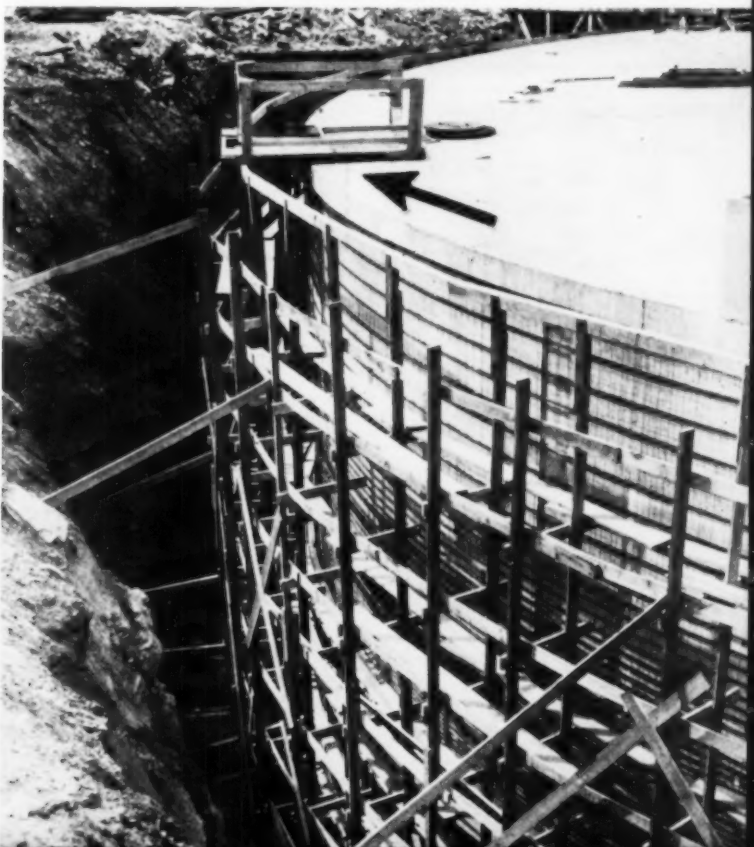
BAND ROD SEGMENT 93 ft. long, weighing about 350 lb. and comprising two lengths of 1½-in. rod joined by turnbuckle, is moved to edge of roof slab for lowering by hand ropes.

Page 73

TANK WALL (below) rests on shelf footing at edge of floor slab. Vertical spacing bars anchored to form ties in concrete wall support band rods on retractable spikes.



ROOF EDGE HOPPER (below) partly supported by inner rail of scaffold delivers concrete through flexible spout to wall forms. Band rods have been applied to top of tank wall, and wire-mesh reinforcement is in place.



Engineer Corps Recruits

Learn Their Job

Under Combat Conditions

AMERICAN ENGINEER TROOPS and American construction equipment are establishing a worldwide reputation for building bases overseas. From the ranks of the construction industry come skilled workers to build and fight for the U. S. Army. Before shipment to battle zones all over the world, these recruits receive training in the construction work they will do under combat conditions. The accompanying official photographs show men of the Corps of Engineers learning their jobs at the Desert Training Center in California. Here they are trained in airport building, port construction, camouflage, equipment maintenance and repair, road building, topography, and combat.

Now under way is a recruiting program through which the Engineer Corps hopes to obtain 100,000 mechanics and technicians representing all branches of the construction industry and the allied machinery and equipment fields. Eligible for enlistment are all men between the ages of 18 and 50 with special construction skills. On entering military service they will be assigned to General Service Regiments, Aviation Engineer Battalions and Regiments, Combat Engineer Battalions, Bridging and Ponton Units, Water Supply Units and other outfits that require skilled personnel. Units thus created will be activated for use in actual theaters of war.

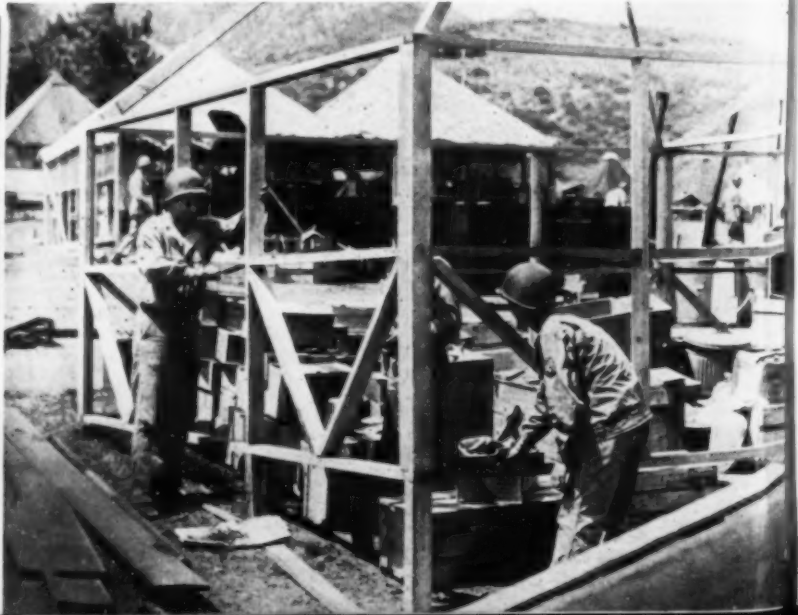
The way is open for qualified men to earn specialist and noncommissioned officer ratings. They can make up to \$138 a month, plus a 20-percent increase for service outside the United States, as well as the regular army allotments for dependents, food, quarters, and other allowances. Application can be made at any Engineer Corps office.

ENGINEER SERGEANT TECHNICIAN with oxyacetylene torch (below) makes emergency repairs to angledozer. In field minor repairs will be made within each company by mechanics and operators. Repair work of greater magnitude will be done by regimental service unit, equipped with mobile shop. Major repair and overhaul work will be responsibility of maintenance unit accompanying regiment.



Page 74

SHOPS AND STOREROOMS (below) are erected as Engineers practice carpentry and timber-frame construction.



LESSON IN ROAD CONSTRUCTION under combat conditions is offered Engineer troops. Dump-truck



AT ENGINEER "TOOLROOM" soldiers are trained in orderly job housekeeping since misplaced tools overseas cannot be easily replaced.



and bulldozer team proved potent weapon in rapid road construction during Tunisian campaign.



RECRUITS AT TRAINING CENTER build everything from temporary barracks to roads. Here operator gets practice in running motor-grader.



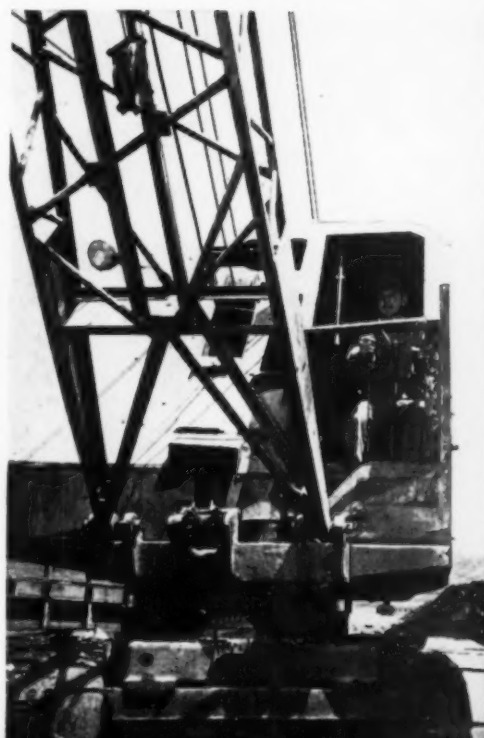
ALL PHOTOGRAPHS BY
LOS ANGELES DAILY NEWS



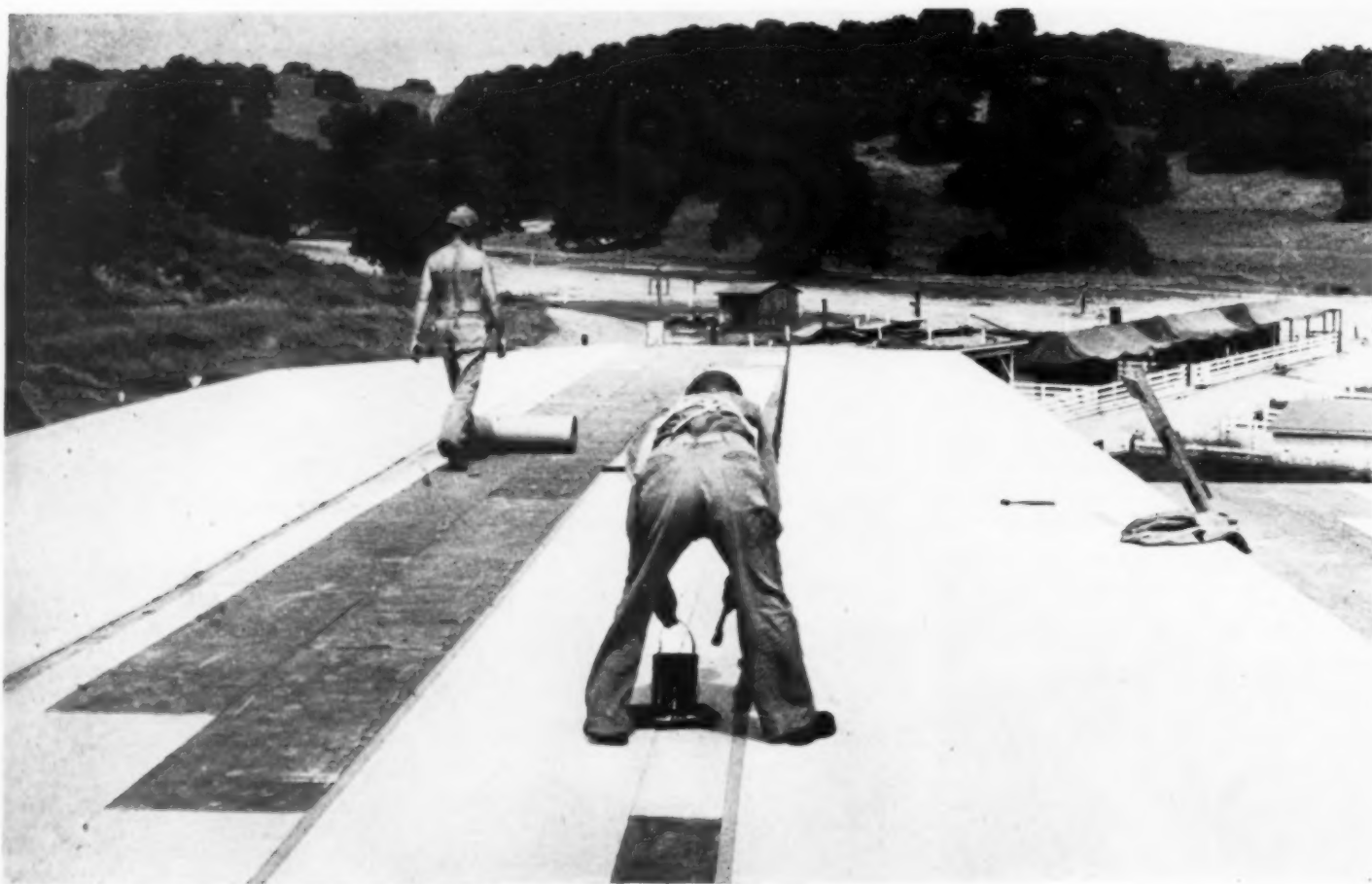
MOBILE CLAMSHELL CRANE helps screen crushed stone in hurry.

SURVEY PARTY (below) learns how to run line and grade. Headquarters company of each general service regiment carries surveying instruments into field.

ENGINEER SOLDIER operates crane (right). Heavy-duty machines are taken into field by equipment companies, to be furnished to construction regiments as needed.



Engineer Corps Recruits *Learn Their Jobs . . .* Continued



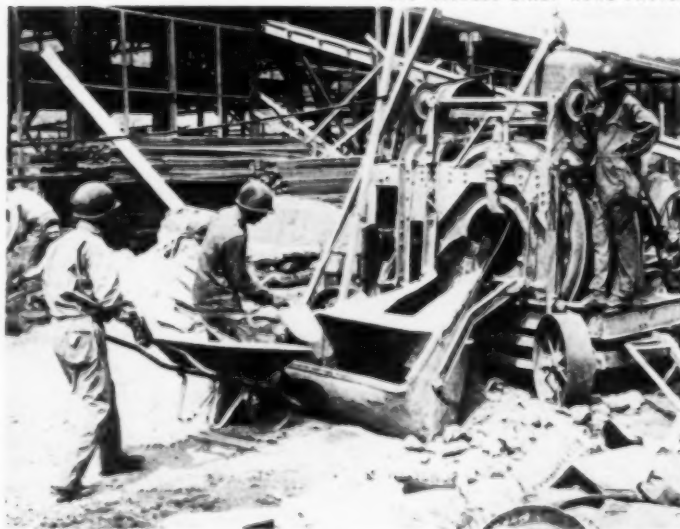
BUILT-UP ROOF IS LAID on storage shed. Speedy erection of sheds and barracks is essential Engineer training.



CRUSHED STONE is deposited and system of tile pipe is embedded in stone to form part of sewage treatment plant.



LOS ANGELES DAILY NEWS PHOTOS



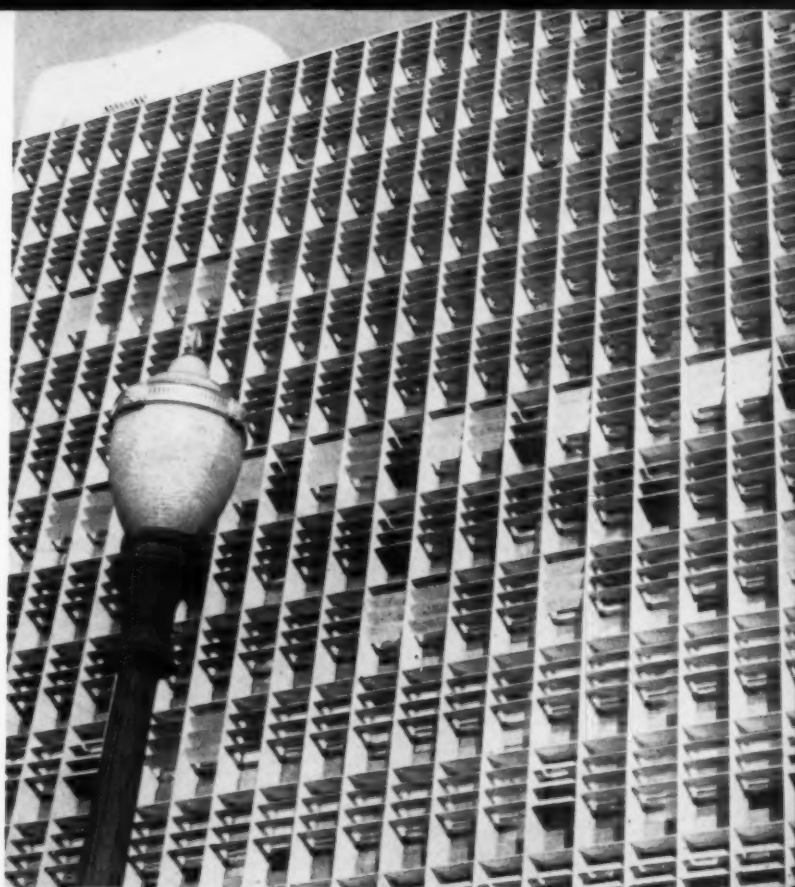
MIXING OF CONCRETE is basic construction operation in which Engineer specialist troops are thoroughly grounded.

JOB

oddities



SOLID SILVER BUS BAR SECTIONS (left) are laid out to be assembled for installation at Dow Magnesium Corp. Michigan plant, erected for Defense Plant Corp. by The Austin Co., of Cleveland. Tons of silver, an efficient conductor of electricity, were lent by government to release copper for other war products.



MOVABLE OUTSIDE SUNSHADES to provide maximum air circulation and optimum light intensity for office workers in Brazil's new Ministry of Education and Health Building in Rio de Janeiro are new architectural features applied to north sides of structures (corresponding to southern exposure in northern latitudes). At each floor level thin concrete slats are cantilevered outward 4 ft. from windows and similar vertical projections break up facade into huge honeycomb. Asbestos louvers in upper portion of each rectangular cell are manually controlled and can be directed, according to position of sun, to admit sufficient air and at the same time exclude all direct sun rays and reduce excessive light intensity.

C. I. A. A. PHOTO

ONLY MOUNTED POLICEWOMAN (right) in San Francisco Bay area shipyards is **CHARLOTTE LEE**, horse trainer and rodeo rider, on duty at Richmond, Calif., Shipyard No. 2 of Permanente Metals Corp.



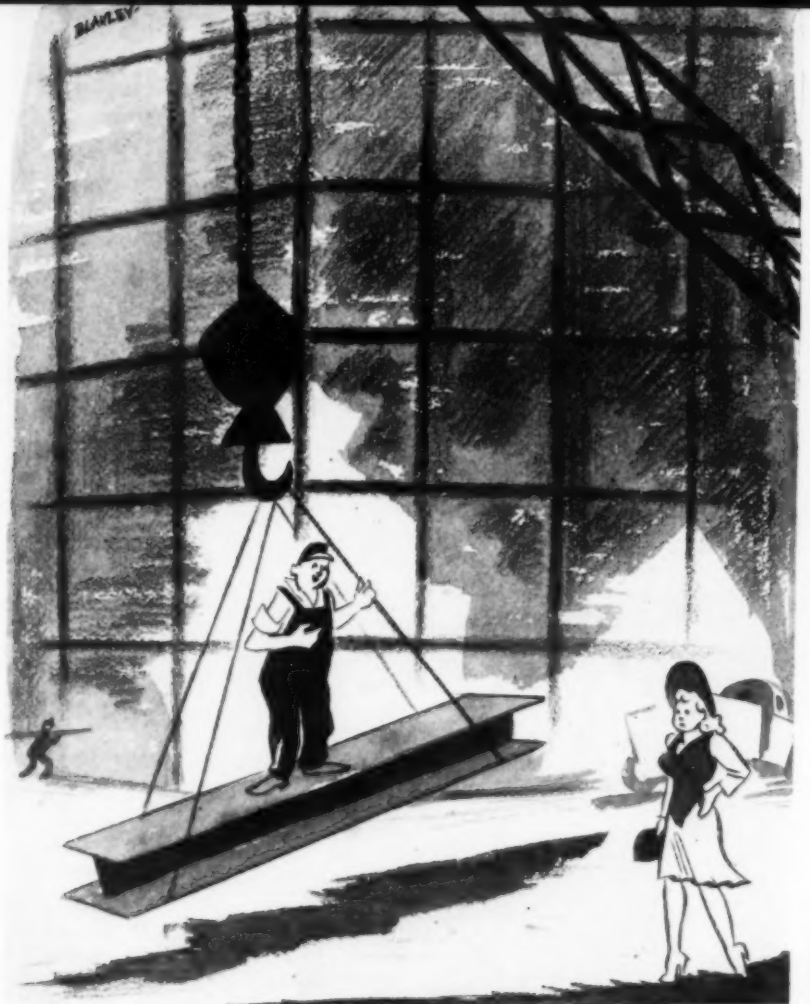
NEEDED IMMEDIATELY on Harvard, Neb., airport project, six new Tournapulls with Carryalls were driven 544 mi. from LeTourneau plant in Peoria, Ill., to Nebraska for owner, Green & Groesbeck Construction Co., of Des Moines, Iowa. Driving time was 40½ hr., averaging approximately 13 m.p.h. Three units then were driven 130 mi. to another job at McCook, Neb.

AMPHIBIAN TRUCK (right) tows 105-mm. howitzer across field. Christened "The Duck", it is as much at home in water as on land. On land, unit can be driven through all six wheels. In water, it is driven by rear-mounted water propeller. It is manufactured for Army by General Motors Truck & Coach.



THE JOB JESTER

CARTOONS DRAWN FOR CONSTRUCTION METHODS



"Care to come up and see my blueprints?"



"We're building a military road and we're not supposed to know where it's going!"



"I just wanted to tell ya' Hargraves an' me are quit-
tin', Boss!"

Army Engineers in North Africa

Set New Speed Records for Building Roads and Airports

PORTABLE LANDING STRIP is laid by Engineer Corps. Advantage of sectional steel mat landing strip is that it can be speedily installed and easily repaired if bombed.

ARMY SIGNAL CORPS PHOTOS



ARMY ENGINEER TRUCKS unload steel mats which will be used in construction of emergency airport runways in war zone.

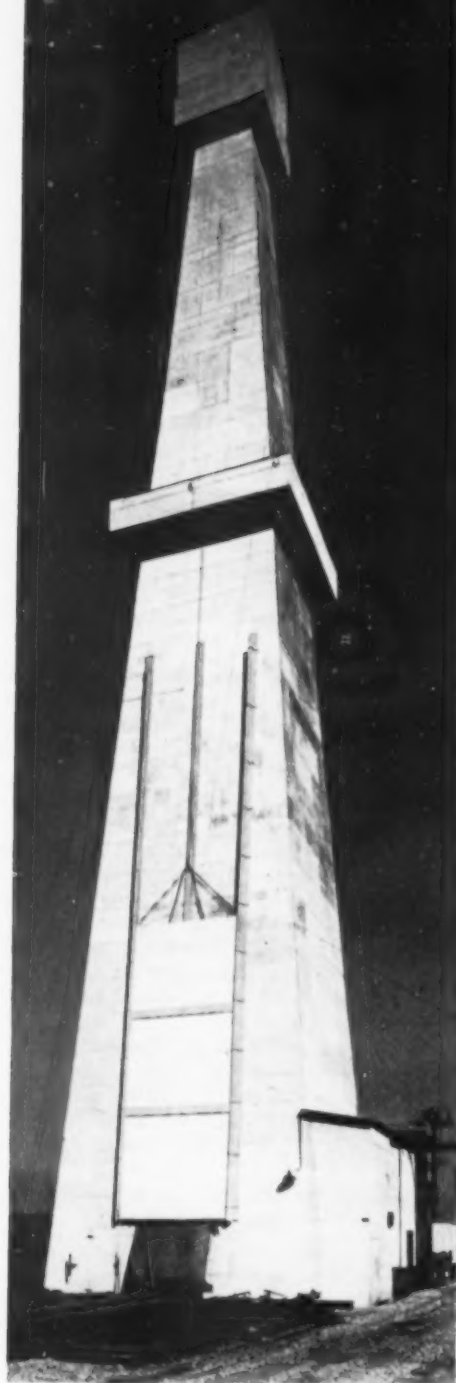
DESERT ROADWAYS are being laid out at the rate of 4 mi. an hour by combat units of the Army Corps of Engineers in North Africa. As a result of new techniques and equipment, the War Department reports, even higher speeds are now in prospect.

Specially organized pioneer road teams make possible the swift construction or passable routes that allow heavy supply trucks to race forward at the heels of advancing troops. A powerful six-wheel drive truck carrying a tractor equipped with a bulldozer runs ahead to attack difficult crossing points such as steep-banked washouts. It is followed by V-drags, pulled either by tractors or tanks at a rate of 12 m.p.h. These clear the roadway of debris and do some grading. A high speed motorized grader finishes the job.

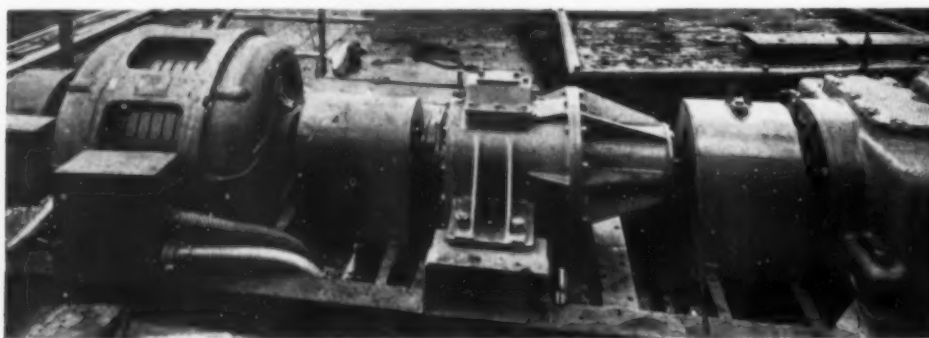
Speedy construction of advance air-
(Continued on page 118)

TANKS ROLL OVER PONTON BRIDGE (below) constructed by Engineers across Pee Dee River. Constructed for Carolina maneuvers, bridge is typical of Engineer-built structures in all theatres of war.

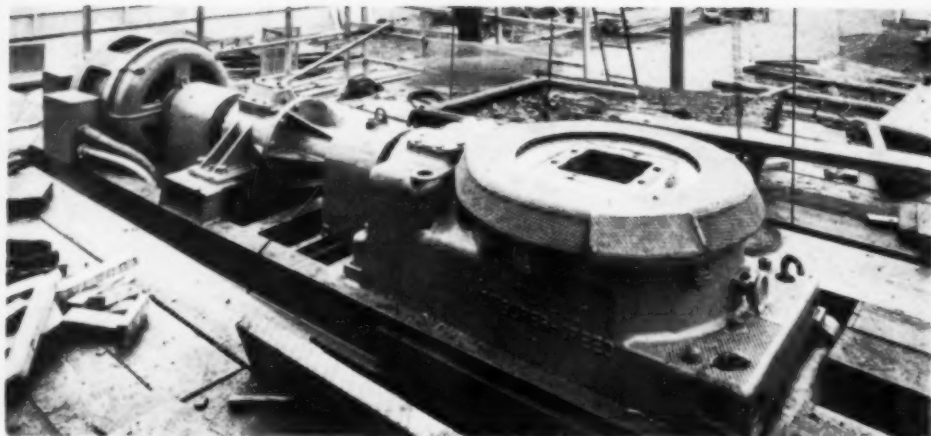




COMPOSITION BOARD AND ROCK WOOL cover 136-ft. oil derrick operated by Shell Oil Co. in Los Angeles Co. Located in residential district, it is completely inclosed to prevent noise, odor, vibration, and fire.



TWIN VARIABLE-SPEED MOTORS of 150-hp. each drive mud pump equipment. Controls are mechanically interlocked to operate as single unit. All control except resistors is oil immersed to reduce gas fire hazards. Enclosure at extreme left houses collector rings.



ROTARY TABLE MOTOR affords maximum speed flexibility during drilling. Power at 440 v. is supplied to 250-hp. Westinghouse wound-rotor motor with gas-protected collector rings. Two-to-one reduction gear connects motor to rotary table.

All-Electric Oil Rig

**Operates From 136-Ft. Inclosed Derrick
Within City Limits**

FOR THE FIRST TIME in petroleum production history, an oil well is being drilled with electrically driven equipment from an almost completely sound, odor, fire and vibration-proof rig inside the city of Los Angeles, Calif. The derrick, a 136-ft. high structure, is completely sheathed by composition board and rock wool. Previous covered drilling rigs have been only partially inclosed, to protect surrounding buildings from drilling spray. Engineers for the Shell Oil Co., owners and operators of this exploration in the Old Salt Lake Field near the widely known La Brea Tar Pits, believe this installation is one of the most unusual in the oil industry.

Electric motors, totaling 1,250-hp., drive all drilling and mud pump equipment. The rotary table is driven by a 25-hp. gas-protected Westinghouse vari-
(Continued on page 107)



DRILLERS FASTEN ELEVATORS to pull drill stem out and replace bit. Electric motors, totaling 1,250 hp., drive all drilling and mud pump equipment.

Present and Accounted For...A PAGE OF PERSONALITIES



SOUTHEASTERN ASSOCIATION OF STATE HIGHWAY OFFICIALS is headed by C. W. PHILLIPS, Tennessee state highway commissioner. Instrumental in passing state's first road law in 1929, he served as road commission chairman and county judge until becoming commissioner in 1939.



BUILDERS OF HOMES FOR WAR WORKERS of Moore Drydock Co., at Oakland, Calif., are these key construction men of Barrett & Hilp, San Francisco contractors, here shown in conference on project for 44 apartment buildings each containing 12 living units. Left to right are: JIMMY WARN, superintendent; LLOYD SIMPSON, project manager; LEE MERRIL, subcontractor; CESAR DENARDE, general carpenter foreman; BOB REVHEIM, in charge of prefabrication and BILL MANNING, in charge of labor and equipment for company.



NEWLY ELECTED PRESIDENT of Society of American Military Engineers is FREDERICK HALL FOWLER, consulting engineer, of San Francisco. An officer of the Corps of Engineers, U. S. A., during first World War, he is past-president of American Society of Civil Engineers.



ORDER OF MERIT of Westinghouse Electric & Mfg. Co. for outstanding contributions to electrical industry went to GEORGE H. A. PARKMAN, director of the company's construction department. Award is in recognition of his work in speeding company's war construction program.



ARKANSAS CHAPTER of Associated General Contractors of America has elected as president R. T. HIGGINS, of Hot Springs. Mr. Higgins has been active in building construction for 15 years and is best known for building and remodeling part of Bath House Row in Hot Springs.



UNANIMOUSLY ELECTED to head Highway Contractors' Division, American Road Builders' Association, is JAMES J. SKELLY (left), president, Associated Pennsylvania Constructors, Media, Pa. Taking office at the 1943 ARBA meeting, Mr. Skelly assured delegates that contractors can handle any size post-war road program.



NEW SUPERINTENDENT OF PUBLIC WORKS for New York State is CHARLES H. SELLS (right). Returning early this year from Iran, where he directed a \$16,000,000 lend-lease construction program of supply lines through Iran to Russia for Foley Bros. Spencer, White & Prentiss, Inc., he has since then surveyed airport projects in Brazil for federal government. In addition to direction of bureaus of canals, highways, public buildings, architecture and surveying, Mr. Sells is member of flood-control and post-war planning commissions.

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TIME
LABOR
MONEY
AND
Critical Materials

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**Concrete
Pier Forms**

Laminated Fibre Tubing
6 Standard Sizes

INSIDE DIAMETER					
8"	9"	10"	11 1/4"	12"	13 1/4"
SQUARE INCHES					
50.26	64	78.54	100	113.1	144

IMMEDIATE DELIVERY



cut to size (pier heights) on the job—braced or back filled on footing—ready to pour.

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Cantonments and other Government Construction

U. S. Army Engineers
U. S. Navy Department
Yards and Docks
P. B. A. and F. H. A.

WRITE FOR DELIVERED PRICES

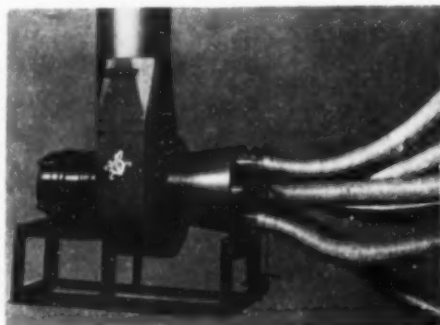
SONOCO PRODUCTS COMPANY

HARTSVILLE, S. C. MYSTIC, CONN.
ROCKINGHAM, N. C. GARWOOD, N. J. LOWELL, MASS.

CONSTRUCTION EQUIPMENT NEWS

AUGUST, 1943, REVIEW
of Construction Machinery and Materials

FUME EXHAUSTER keeps fumes, gases, dust filings and grinding compounds from contact with motor. Centrifugal type blower wheel is made of 1/8-in. thickness of steel. Ball-bearing motor (3 hp.)



is tested to overload capacity to meet rough usage. Framework is welded into strong heavy unit with handles for carrying. Adapters are interchangeable and can be used for suction or blowing. Can be used in shipholds, welding rooms, tunnels, vaults, and basements.—**Chelsea Fan & Blower Co., Inc.**, 1205 Grove St., Irvington, N. J.

★ ★ ★

TRACTOR DONKEY, model D7L mounted on Caterpillar D7, is designed for cold decking logs, loading log trucks, operating skyline, piledriving, or operating dragline or slackline scrapers. Unit has



three cable drums, main, haulback and straw-drum, with two operating speeds on each. Main drum spools 960 ft. of 1-in. cable and has available line pull in low gear of over 30,000 lb. Haulback and strawline drums are in proportion.—**Williamette Hyster Co.**, Portland, Ore.

STEEL HARDENING SOLUTION prolongs life of all types of edge tools through special formula that imparts tremendous toughness and hardness. Said to harden cutting edge beyond point obtainable by ordinary quenching methods and to save time through eliminating drawing of temper or color when quenching tools. Works well with either water or oil quenching steels.—**Steeltem Chemical Co.**, 51 E. 42nd St., New York City.

★ ★ ★

DIRECT-CURRENT VERTICAL MOTORS are designed for low-thrust, solid-shaft applications on pumps, machine tools, and marine underdeck auxiliaries. Desirable in cases where valuable floor space must be saved or expense of gearing avoided. Range from 40 to 200 hp. at 1,750 rpm. and in equivalent ratings at other speeds. Furnished for both constant and adjustable speeds. Are of drip-proof, protected construction, providing complete protection from dripping liquids and falling objects. Convenient fittings on both upper and lower bearings simplify lubrication and provision for escape of excessive grease reduces possibility for over lubrication. Special bearing housing prevents grease from entering motor and damaging commutator and windings. Cast-iron conduit box is roomy and can be arranged for bringing loads in at top, bottom, or either side. Two hand-hole covers, removable without use of tools, permit quick and easy inspection of commutator and brushes. Ring-type base has accurately machined rabbet and jig-drilled mounting holes, assuring permanent alignment with driven machine. Sturdy lifting lugs facilitate installation.—**General Electric Co.**, Schenectady, N. Y.

★ ★ ★

SYNTHETIC RUBBER COMPOUND, made from Ameripol, is used in construction of bolted tanks for storage of high octane gas and aromatic fuels used in military aircraft. Sealing strips of new compound 1 3/4 in. wide and 3/32 in. thick are placed at points where sheets of metal are bolted together. Bolts, 1/2-in. diameter, are used to squeeze synthetic rubber tightly between plates, assuring perfect fuel-tight seal.—**B. F. Goodrich Co.**, Akron, Ohio.

DURABILITY



TO KEEP YOUR GRADERS ROLLING FOR VICTORY...

- ✓ Check condition of engine regularly.
- ✓ Change lubricating oil and renew filter elements every 100 hours of use.
- ✓ Lubricate all parts of grader regularly.
- ✓ Service air cleaner every 10 hours of use.
- ✓ Clean fuel oil filters at least every 60 hours.
- ✓ Don't ride clutch. Adjust clutch pedal when and as needed.
- ✓ Keep electrical system in good condition—check battery regularly.
- ✓ Keep lost motion out of grader—use adjustments for wear and replace parts worn out.
- ✓ Keep tires inflated to recommended pressure.

If you need help or advice on any of the above, see your local Adams distributor.

JUST AS MODERN TANKS are built to take the terrific battering of front line warfare, so Adams Motor Graders are built to withstand the severe shocks and stresses of carving roads, airfields and naval bases out of all kinds of terrain in all parts of the world . . . Whether in the frozen tundra of Alaska, the rocky hills of Tunisia or the dense jungles of New Guinea, Adams machines keep hard at work with minimum attention . . . DURABILITY is but one of the many Adams features you'll want to consider when choosing equipment for your post-war jobs!

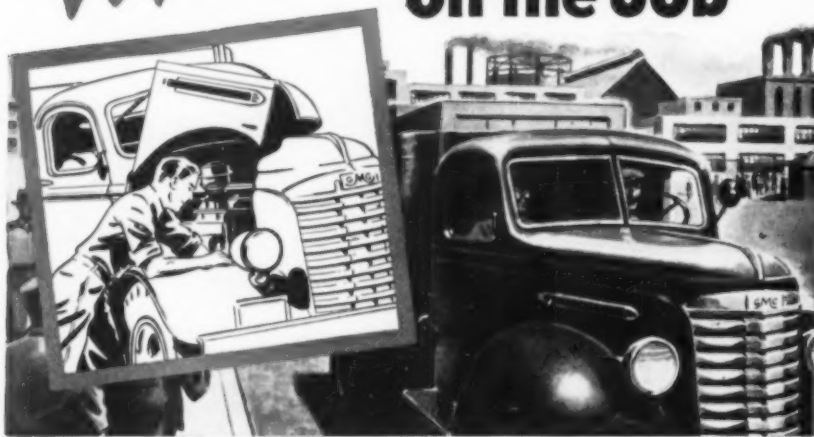
J. D. ADAMS COMPANY • INDIANAPOLIS, INDIANA

Adams motor graders, leaning wheel graders, elevating graders, hauling scrapers, tamping rollers, bulldozers and road maintainers are used by allied forces throughout the world.

Adams

**ROAD-BUILDING AND
EARTH-MOVING EQUIPMENT**

TIME OUT for P.M. Service means MORE TIME on the Job



"An ounce of prevention is worth a pound of cure" is an old saying which has a new meaning for truck owners these days. With their equipment doing double duty on the home front, Preventive Maintenance Service is doubly important. General Motors Truck dealers offer the only P.M. Service backed by 15 years of experience with all types of vehicles in all types of operations. It is called GMC "Victory Maintenance" because it provides for the inspections, services and repairs needed at periodic intervals to keep your trucks pulling for victory!

Special "Service Payment Plan" available through our own YMAC

INVEST IN VICTORY . . . BUY
WAR BONDS AND STAMPS

THE TRUCK OF VALUE

GMC TRUCKS

GASOLINE • DIESEL

A WIDE CHOICE OF NEW MODELS STILL AVAILABLE
THROUGH GMC'S NATIONAL INVENTORY PLAN



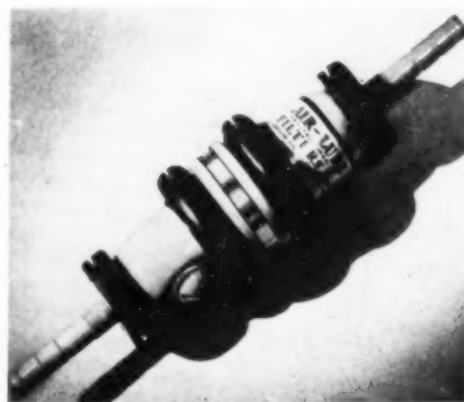
EYE SAVERS. new, highly efficient, all-plastic goggles, are only design authorized to use high-priority Plexiglas for lenses. Lens material is crystal clear, non-distorting, and will not shatter or splinter under impact. Goggle fits directly over



prescription glasses and full frame gives added protection against injury from sides, top, and bottom. Lenses can easily be removed for cleaning or replacement. Frame is strongly reinforced with metal clip at bridge and amply ventilated to prevent fogging. Weighs 1 3/4 oz. Snap-in filters are available for torch welding or cutting and other glares.—Watchmoke Optical Co., Providence, R. I.

★ ★ ★

AUTOMATIC LUBRICATOR for feeding regulated oil mist into air tools eliminates need for frequent daily oiling, prevents "freezing," and saves air-driven equipment. Exceptionally lightweight Air-

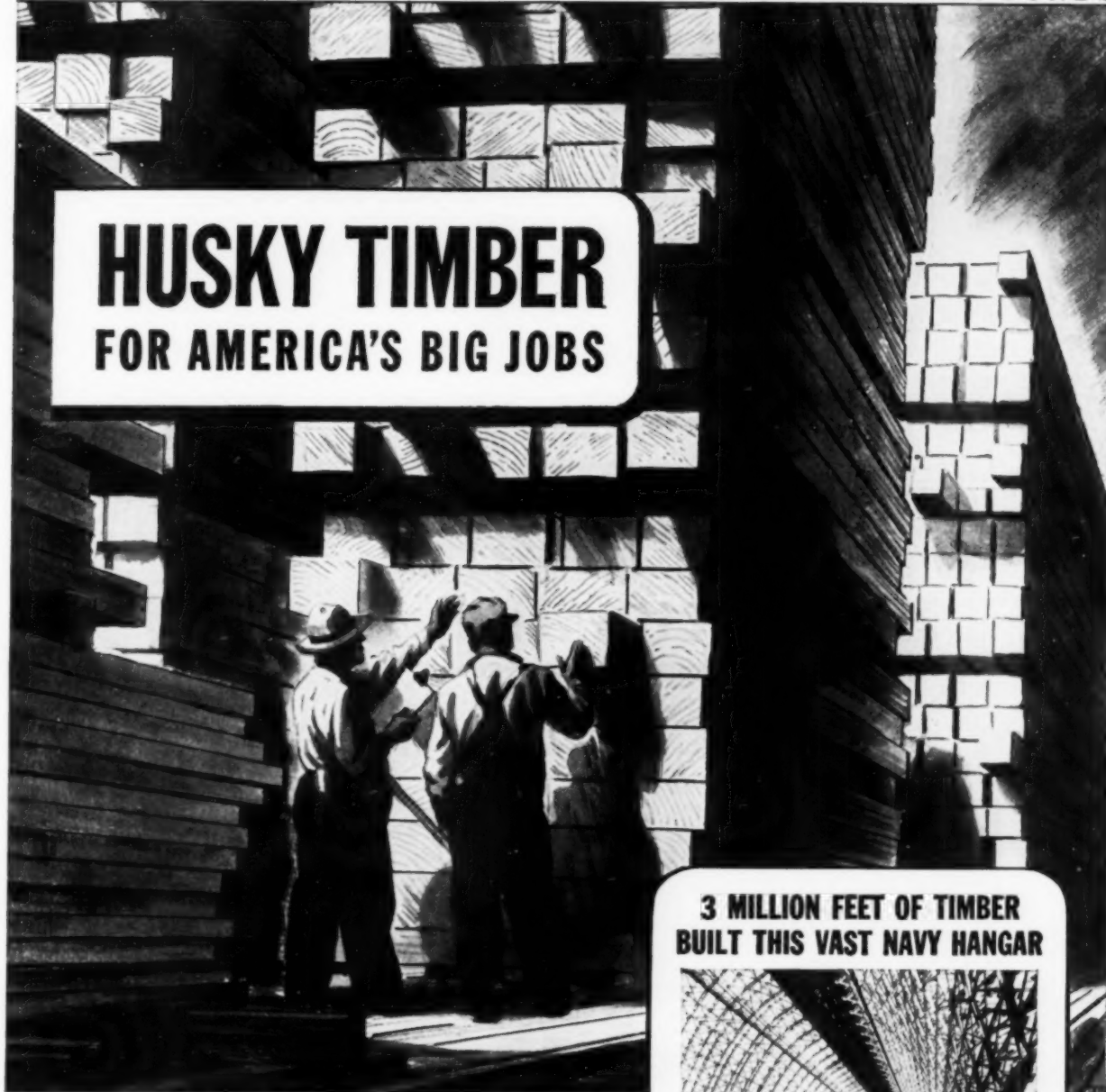


Lube lubricator is recommended for use in air hose from 1 to 6 ft. from tool or may be used in air pipes for larger air-driven stationary or semi-portable tools. Also adaptable for air passages in machine. Positive feeding action provides regulated amount of oil but feeds oil only when tool is operating. Oil reservoir holds enough oil for more than week under normal usage. Clear lucite window shows when it needs refilling. Installing lubricator in hose near tool eliminates deterioration of rubber hose lines. Positive regulated wick-

FREEDOM IS NOT FREE~IT IS PRICELESS ★ BUY WAR BONDS

HUSKY TIMBER

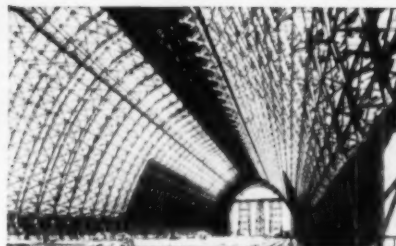
FOR AMERICA'S BIG JOBS



The TECO Connector System of timber prefabrication makes it possible to employ timber *efficiently* and *economically* in heavy structural engineering. Many great war plants, shipyards, docks, warehouses, hangars, bridges, and towers have been built entirely of timber under the TECO Connector System. From the lumber to the finished unit, every step in modern prefabrication is controlled by sound engineering practice. The use of TECO Split-Ring Connectors and TECO precision grooving tools results in a high degree of speed, both in assembly and in erection.

For Modern Timber Construction
Specify TECO Timber Connectors and Tools
Sponsored Since 1911 By The National Lumber Manufacturers Association
WRITE FOR TECO'S FREE LITERATURE AND LIST OF ENGINEERING SERVICES

3 MILLION FEET OF TIMBER BUILT THIS VAST NAVY HANGAR



Construction view of one of the Navy's mammoth new blimp hangars. Length 1,000 feet; clear-span width 237 feet; height 153 feet. Timber prefabricated by Timber Structures, Inc., Portland, Oregon.



The **TECO** Ring Connector spreads the load on a timber joint over practically the entire cross-section of the wood . . . brings the full structural strength of lumber into play.

WASHINGTON, D. C. **TIMBER ENGINEERING COMPANY** PORTLAND, OREGON.



"HERE'S A PACKAGE"—

designed for the many jobs required in construction and maintenance that call for a portable compressor and the tools to put this power to work . . . No matter how distant or how inaccessible your location is—one order, one shipment brings you this compact, ready-to-work power plant and tools.

THEY'RE ALL IN THIS COMPLETE UNIT

A Model 105 SCHRAMM Compressor with special racks and tool boxes with fixed locations for each tool and accessory, so that most any compressor requirement that arises can be met and handled. Equipment includes: Double hose reels, live air type, each equipped with three 50 ft. lengths of $\frac{3}{4}$ " air hose. Air receiver with three extra outlets, equipped with quick action valves, hose couplings and $3\frac{1}{2}$ " vise for flat or pipe work, on swivel base. Tools recommended depend entirely on users re-

quirements and the ability of tool manufacturer to furnish them under existing conditions.

Write Today for Bulletin C-9

SCHRAMM INC
THE COMPRESSOR PEOPLE
WEST CHESTER, PA.



. . . are the choice of those who want JACKSON standards of quality, dependability and performance. No other flexible shaft vibrator can offer such assurance.

Supplied with a 2 $\frac{1}{2}$ " and a 1 $\frac{1}{2}$ " head. These two heads give user a vibrator efficient in and suitable for a wide range of applications. For instance, from wall sections of comparatively large size to narrow sections.

Model FS-6A, illustrated above, is furnished complete with 7, 14, 21 or 28 feet of shaft. Has dirt-proof turntable base. Supplied with or without wheelbarrow mounting.

Write, wire or telephone for further information

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON, MICHIGAN

ing action with automatic shutoff prevents flooding of air tools with oil. Unless otherwise specified, two standard settings are provided from factory, so operators cannot tamper with oil feed settings. Simple to install and maintain.—Filters, Inc., 1515 Gardena Ave., Glendale, Calif.

★ ★ ★

CARBIDE TOOL CHIP BREAKER GRINDER will grind chip breakers in single point tools and roller turner tools. Can be adapted to use for grinding flat farm tools and round or square boring bits. Can handle tools up to 2 in. wide. Increased table length with 10 $\frac{3}{4}$ in. of travel makes possible grinding of breakers in both right and left-hand tools without moving universal fixture on table. Designed for use of 6-in. wheels, head is verti-

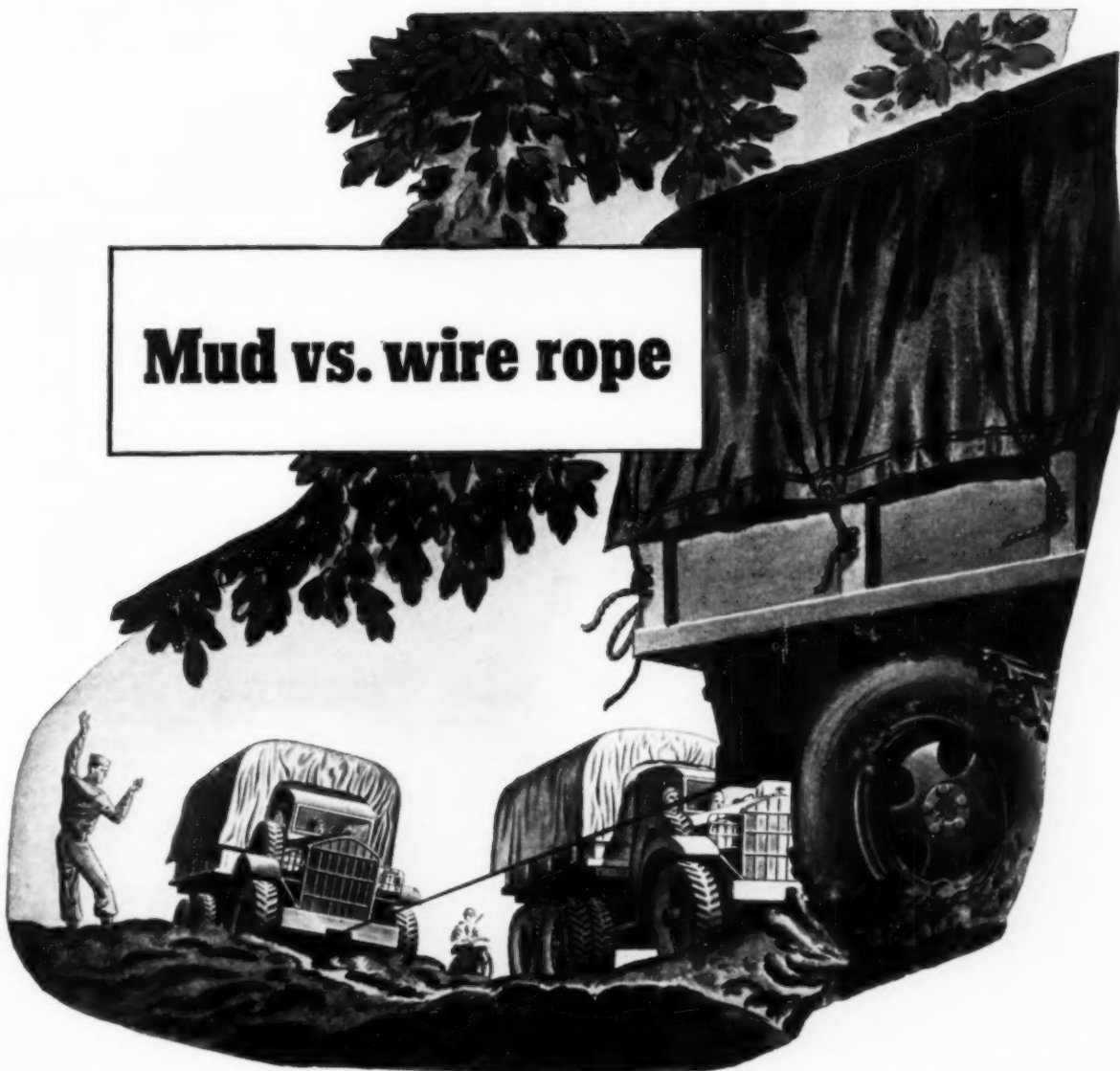


cally adjustable from either side of machine. Base, 29 in. high with large storage space for tools and wheels, is available. Standard motor is single phase 110 v., 60 cycle, $\frac{1}{4}$ hp. at 3,450 rpm. Universal fixture and vise for holding tools up to 1 $\frac{1}{4}$ in. wide is provided. Fixture is designed to tip 90 deg. either side of horizontal and center can be cross-fed 1 in. past center of wheel. Standard equipment also includes wheel guard and wheel lubricant tank, necessary wrenches, and flexible light bracket and reflector. Traverse mechanism can be changed from direct drive to slow speed through five-to-one reduction ratio to give short stroke at slow speed while allowing convenient hand motion. Shipping weight without pedestal, which weighs about 100 lb., is 290 lb.—Carboloy Co., Inc., Detroit 32, Mich.

★ ★ ★

FLARING TOOL, known as Flaremaster, is designed to produce double strength flare that will not crack or collapse, with speed and precision, on any ferrous or non-ferrous tubing in sizes from $\frac{1}{8}$ to $\frac{3}{8}$ in. Consists of pair of holding jaws and U-shaped clamp with built-in vise. Does not require special wrenches nor use of work bench. All wearing parts and punches are of hardened steel. Jaws are counter-bored to provide exact length of tubing to insure correct double flaring for each size.—Everhot Products Co., 2055 W. Carroll Ave., Chicago, Ill.

Mud vs. wire rope



We can't stop the rains, but we *can* provide a means for pulling stalled jeeps, trucks and tanks out of the clutches of that obstinate and gluey old campaigner, General Mud.

Bethlehem's wire rope mill is producing many thousands of emergency winch cables, carried as standard equipment on trucks and tanks. We make up these cables complete, with fittings and hooks all ready to be used. Millions of feet of Bethlehem wire rope have already gone into this service.



Bethlehem Manufactures Wire Rope for all Purposes



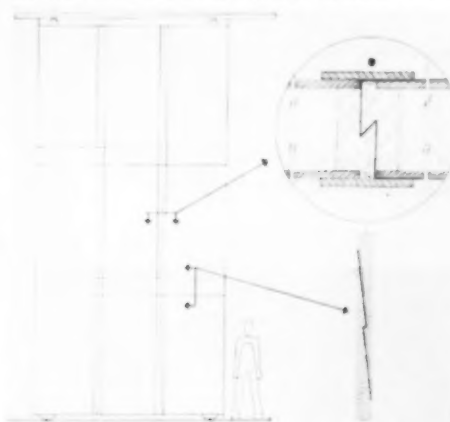
HOW TO KEEP DIESEL ENGINES RUNNING AT PEAK EFFICIENCY

With this sturdy, portable, lightweight Adeco Nozzle Tester, any mechanic can easily make quick, accurate tests on injector opening pressure, spray pattern, etc.; and detect stuck needle valves and leakage around valve seats. Adeco advantages have made this America's most widely used nozzle tester. Tests both large and small injectors, on bench or engine. Avoids costly delays and possible damage to engine. Keeps diesels operating at peak efficiency.

• Write for new illustrated bulletin.



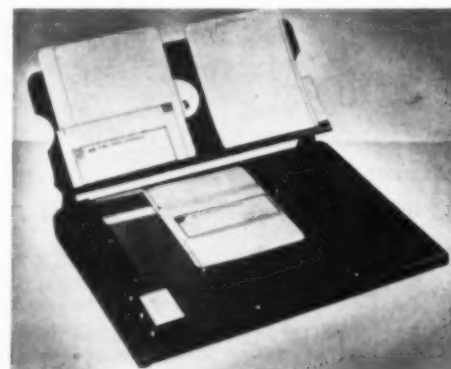
HOLLOW PLYWOOD PANEL DOOR is designed for airplane hangars, blimp and dirigible hangars, PT Boat plants, aircraft plants and other wartime purposes. Panels are prefabricated and assembled to slide either vertically or horizontally. Constructed of standard width plywood pressure glued to dressed wood framework. Plywood surface is scarfed, providing one continuous piece of plywood full length of panel. To join sections in field, dressed wood framework is also scarfed. Joining



is accomplished by use of resin glue under bolted pressure and reinforced with plywood battens also glued in place. All exposed ends of sections are finished off with continuous dressed wood framing members with thickness of internal framework plus thickness of plywood, thereby sealing edges of plywood. Horizontal sections are framed vertically and vertical doors horizontally. All doors are given coat of plywood moisture repellant sealer to prevent checking and provide undercoat for field paint. Box-girder construction provides unusual strength and saving in lumber. Board lumber requirements are reduced 25 to 50 percent over conventional field-fabricated methods. Steel saving is estimated at 15 lb. per sq. ft.—Peelle Co., 47 Stewart Ave., Brooklyn, N. Y.

★ ★ ★

PAYROLL FORM-HOLDING DEVICE, known as Form-Master, saves 61.6 percent of man-hours in payroll departments. Made entirely of wood to eliminate critical materials. Through its use, em-



ployees' checks or cash payroll statements, payroll summary sheets, and individual earnings records are posted at same time. Claimed to make possible more perfect registration of forms, and to accelerate speed with which work can be done.—Todd Co., Rochester, N. Y.

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Here is a compact, handy manual by two well-known engineering writers, that meets all needs for quick review of, or reference to, the most important elements of designing simple structures—of special value to those preparing for license or registration exams.

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- useful thumb-nail review of materials; characteristics, properties, fabrication, working stresses, etc.
- chapter of classification and requirements of loads for various types of structures
- methods of computing deflections of beams and trusses, with applications to typical problems
- elements applying to the design of connections and splices



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**" WITH Gulf Products our trucks deliver
dependable service
12 hours a day,"**

says hauling contractor for war projects



"Proper Lubrication and efficient fuel performance keep our equipment continuously on the move at low cost"

Today the care and maintenance of large truck fleets, such as the one operated by William A. Harting of Lansdowne, Maryland, is no easy task. It demands exacting attention to every detail—one of the most important of which is the use of proper lubricants and fuels.

Construction men have found through experience that the use of high quality petroleum products is the surest guarantee of efficient operation and the best insurance against breakdowns or mechanical failures. That is why so many contractors engaged in vital war construction work today are turning to Gulf Quality Products.

In addition to their high quality, there are three additional advantages in using Gulf products: first, an experienced Gulf engineer recommends, on the job, the proper types and grades for each requirement; second, you're sure of getting lubricants exactly suited to your equipment and to your operating conditions



William A. Harting, contractor of Lansdowne, Maryland, is engaged in hauling under sub-contract for many firms doing war-construction work in Maryland. He has just completed hauling for a large airport, and is now building defense highways leading to several Naval and Air bases. His fleet consists of 65 trucks of 3½- to 5-ton capacity with an average load of 4 cubic yards. He is shown above conferring with a Gulf Service Engineer.

—for the Gulf line includes over 400 quality oils and greases; third, Gulf's wide distribution through more than 1200 warehouses, located throughout 30 states from Maine to New Mexico, insures prompt delivery.

Write or phone Gulf now, and arrange to use Gulf higher quality lubricants and fuels on your next job. They will help you complete it more quickly and at a larger profit.



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a tire is thicker in the tread,
a gun is thicker in the breech,
this shovel is 60% thicker up the
center than at the sides

Strengthens ALL Points
of Wear and Strain *

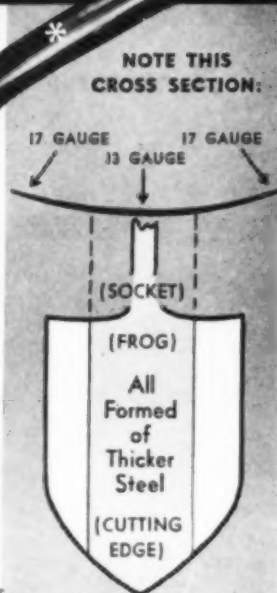


RAZOR-BACK

Correct design gives 13 gauge strength with only 15 gauge average weight, permits deep hang, better working balance.

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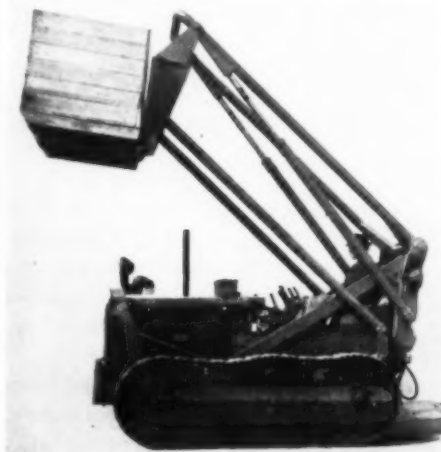
LIQUID PAINT DEODORANT eliminates obnoxious odors when mixed with any paint, varnish, or enamel. Prevents illnesses due to allergies and



nose, throat, and eye irritations. Does not affect color, drying, or durability of finishes. One quart of solution will effectively neutralize 200 gal. of paint. Use in maintenance painting permits normal activities to continue during work. Known as Rid-smel.—Holley Chemical Co., 125 E. 25th St., New York.

★ ★ ★

CARGO LOADER can pick up from ground level and load into plane with floor 10 ft. above ground level. Mounted on track-type tractor, it has good traction under any ground conditions. Is operated by two hydraulic rams, taking power from tractor, and controlled by levers within easy reach of



tractor operator. Platform is available that can be loaded with freight for scheduled flight. Cargo loader then picks up platform and sets it in plane door for unloading and distribution in plane. When load is down in carrying position, highest point is under 7 ft., which will pass under wing of any cargo plane, and operator has clear, unobstructed view in all directions. Tractor can also be used for other work, such as moving planes, loading snow, bulldozing or towing freight.—Pioneer Engineering Works, 1515 Central Ave., Minneapolis, Minn.

★ ★ ★

ELECTRO-MAGNETIC CLUTCH POINTER SCALE provides means of direct indication of rate of flow of fluids such as aircraft engine fuel or lubricating oil. In addition to usual weight indicating pointer, scale is equipped with longer secondary pointer

STERLINGS SPAN THE STATES!

If the millions of wheelbarrows produced by the Sterling Wheelbarrow Company were placed end to end, they would span the United States, coast to coast. Today, many of these sturdy Sterlings are in the service of Uncle Sam, wheeling vitally needed war materials . . . doing their part to help speed VICTORY.

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DIESEL....**

Logging, mining, marine, oil fields, construction, manufacturing and highway truck transportation . . . these are industries essential to a nation at work or a nation at war. In more than a decade of service—spanning both peace and war—these same essential industries have demonstrated that Cummins Diesel power is essential to maximum production at minimum cost.

It is a matter of record that no other American Diesel has ever served so many industries so long and so well. CUMMINS ENGINE COMPANY, Columbus, Ind.



LUFKIN "WESTERN" CHROME CLAD STEEL TAPE FOR HEAVY DUTY



For downright durability and all-around usefulness you can't beat a Lufkin "Western" Chrome Clad Steel Tape. Even in poor light, the jet black markings are easy to read against the satin chrome surface that won't rust, crack, chip or peel. The 1/4-inch steel line detaches from frame and is often used like a chain tape. The sturdy frame and smooth winding mechanism add to a "Western's" utility and long life. See it at your dealers and write for our free catalog 12-C.



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TAPES • RULES • PRECISION TOOLS

which is brought into operation by electro-magnet clutch actuated by interval timer. Secondary pointer can be engaged or disengaged with primary or weigh pointer of scale by means of external control of elastic circuit which operates electric magnet. Useful as automatic tare device. Provides means of accurate compounding of chemicals, such as pharmaceuticals or plastics.—Kron Co., Bridgeport, Conn.

★ ★ ★

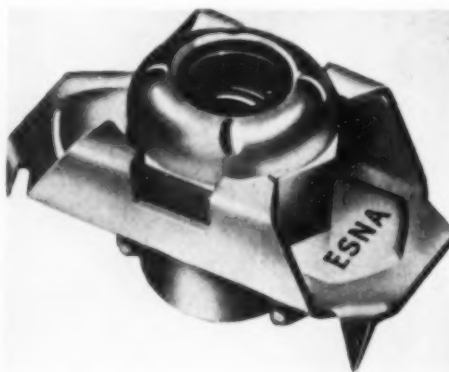
DIRECT FIRED PROCESSING HEATER can provide output temperatures between 150 and 350 deg. F., with heated air free from contamination. Recirculating device allows heated air to be fed



back to heater's intake, so that normal temperature rise obtainable by wiping air around carbon steel fire box produces any temperature up to 350 deg., according to percentage of air recirculated. Percentage is regulated by damper in recirculating duct. Fuel is saved as result of high efficiency of heat abstraction and negligible radiation losses. Skilled labor is not required for operation.—Dravo Corp., 300 Penn. Ave., Pittsburgh, Pa.

★ ★ ★

SELF LOCKING FASTENING DEVICE has been developed for use on plywood construction. Tested and approved by Army Air Corps, it will be used extensively in manufacture of plywood airplanes. Regular elastic stop nut, with red cellulose locking



ASPHALT MIXING PLANTS

STATIONARY and PORTABLE
In All Sizes and Capacities!



★ Hetherington & Berner asphalt mixing plants, products of the pioneer builder of asphalt machinery in America, incorporate the latest features of design which have been proved in performance. Specifications conform to the most rigid state and city requirements, both as to engineering design and safety regulations. Write for Bulletin C-M-260.

HETHERINGTON & BERNER INC.
Indianapolis, Indiana



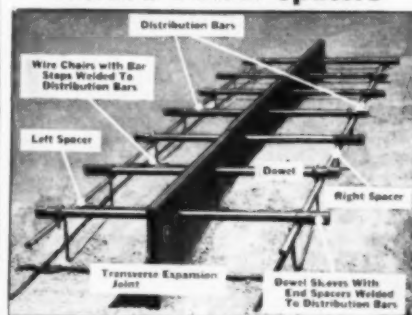
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for the Birds of War!

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Concrete Runways and Aprons with

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Accurate — Rigid
Available Now!



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SAINT LOUIS, MISSOURI

collar, is interlocked with basket that locks into plywood and holds nut securely. Four prongs at corner of basket sink into surface of plywood and two feet inserted into hole are forced into hole as nut descends, firmly anchoring basket. Spring fingers at top clasp nut after it is seated and hold it firm against axial play. Can be driven in with hammer, forced in with press, or drawn in with bolt. Can be used on plywood from 1/8 in. up. Nut is replaceable without moving basket.—Elastic Stop Nut Corp. of America, Vauxhall Rd., Union, N. J.

★ ★ ★

TWO-BLADE ADJUSTABLE FLY CUTTER cuts holes or disks in metals of thicknesses up to 1 in., including boiler plate, stainless steel, cast iron, plastics, and other problem materials. Cuts washers and gaskets from "live" rubber. Generous clearance between work and body of tool makes



possible deeper cuts with less strain on cutter. New cutting technique eliminates chatter and assures clean holes. Available with straight or tapered shank. Covers expansions of 4 to 10 in. in diameter, including all decimal or fractional intermediate sizes. Other models, with three cutting blades, cut holes from 5/8 in. to 5 in. in diameter. Company also makes new adjustable surface facing tool of interest to shops that cannot justify maintaining full line of high-speed end mills and angle cutters. Production is in four models, with expansion capacity of from 1 to 5 in.—Robert H. Clark Co., 3424 Sunset Blvd., Los Angeles 26, Calif.

★ ★ ★

PRINTER is designed to meet needs of industries whose print production has graduated from small to intermediate stage. Simple, speedy and occupying small floor space, Revolute 8Q exposes blue-prints, direct process prints, and sepia negatives up to 54 in. wide without static, slippage, or chalking tracings. Speed ranges from 6 in. to 32 lin. ft. per minute. Employs revolving contact principle, being equipped with Pyrex glass cylinder 8 in. in diameter, mounted in metal end rings and supported on ball bearing rollers. Tracing and sensitized material are held firmly against cylinder by series of narrow contact bars which are permanently guided through machine. Also equipped with quartz high pressure mercury vapor lamp which assures uniform light distribution and freedom

DON'T INSTALL A SELF-PRIMING PUMP TO DO THE WORK OF A DIAPHRAGM PUMP or vice-versa

SAND, SILT AND TRASH WILL CLOG AND WEAR OUT THE SELF-PRIMING CENTRIFUGAL'S CLOSE-FITTING, FAST-MOVING PARTS

THE DIAPHRAGM PUMP CAN TAKE THAT TYPE OF WORK BECAUSE IT'S BUILT FOR IT—BUT FOR A LARGE VOLUME AT HIGH HEADS USE THE SELF-PRIMER

A great deal of grief is encountered on construction jobs where the wrong type of pump is installed. Take for instance, a foundation job where sand and mud are washing in. Here's where you use a diaphragm pump. Or if it is only seepage to be handled, again the diaphragm is used, for its plunger operation allows anything to pass through the pump that can come in the suction strainer.

In cases of large volumes of water to be handled from a coffer dam, excavation, etc., use the self-priming centrifugal pump. In case you have a sump in the bottom of your excavation, make it deep enough so that the dirt can settle out as much as possible and keep the suction strainer off the bottom.

ASK YOUR NOVO DISTRIBUTOR FOR HIS RECOMMENDATION FOR A PUMP FOR YOUR JOB

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RUBBER-TIRED, STEEL, CASTER WHEELS.
4 WHEEL, 5th WHEEL, AUTOMOBILE
STEER. STEEL or HARDWOOD DECKS.

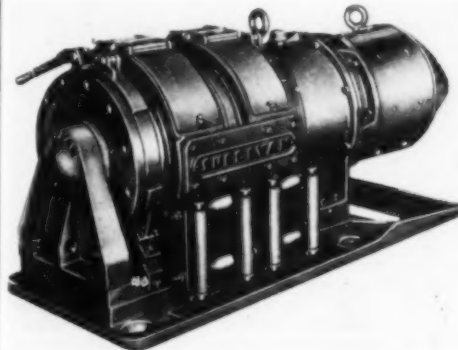
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TOOL WAGONS, LIVE SKIDS, LIFT TRUCKS,
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from ventilating troubles and confines ozone fumes to prevent their escape into surrounding atmosphere. Ventilating system is designed to provide most efficient light output. Speed is indicated on large tachometer, conveniently located at left end of feeding leaf. Can be readily operated by inexperienced help.—Paragon-Revolute Corp., Rochester, N. Y.

★ ★ ★

SCRAPER HAULERS with largest possible drum diameters consistent with portability give longer rope life. Type CF "Universal" hauler is pow-



ered with 25, 30, 35, 45, 50 or 60-hp. electric motor. Clutch bands are out in open for quick heat dissipation and easy inspection of clutch lining. More than 90 percent of parts are interchangeable on haulers of same frame size. Simple, sturdy construction, with comparatively few parts, insures low maintenance costs.—Sullivan Machinery Co., Michigan City, Ind.

★ ★ ★

COMPLETE LINE OF LIFTING MAGNETS supplements firm's present line of magnetic separators, suspended magnet and rectangular lifting magnets. Features include renewable pole shoes of selected alloy steel, ribbed coil shield, uncoil construction, excellent heat dissipation, better coil weight support to hold coil securely, leads and terminals fully protected against damage and shock and readily accessible for inspection without disturbing insulation which is permanently sealed, windings vacuum impregnated to eliminate possibility of electrical trouble, and waterproof construction. Useful for loading and unloading, moving large quantities of material, and increasing storage capacities.—Stearns Magnetic Mfg. Co., Milwaukee, Wis.



"Old friend... fine wire rope"

Several thousand miles to the west of where you're reading this, an American face lights up as a welcome friend from home arrives.

Back here in the States, like thousands of others now in uniform, he learned the friendliness of dependable Wickwire Rope.

He knows *you* need Wickwire Rope, too, to keep things running on the home front. So he appreciates *your* contribution in making the rope you

already have last longer, so more can be spared for the important work over *there*. But when you *do* order, won't you take it in coils when the lengths permit—so the handier reels can go to the front? Wickwire Spencer Steel Company, 500 Fifth Ave., New York.



For outstanding production accomplishments, Wickwire Rope was the first in all New England to win the coveted Maritime M and Victory Fleet Flag.



WHEN CUTTING WIRE ROPE, seizing is important, whether it is pre-formed or standard lay. The free book "Know Your Ropes" will help your new men (old, too!) learn the right and wrong ways to care for and handle wire rope to make it last longer. Send for your free copy.

SEND YOUR WIRE ROPE QUESTIONS TO WICKWIRE SPENCER



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• Page Buckets answer today's call for speed on all earth-moving jobs, because, automatically, they dig right in, doing more work per shift. The result is lowered cost of operation—**INCREASED PROFITS** for you! It's the **AUTOMATIC** feature of a Page Bucket that causes it to strike first on its forward arch, and rock back on the teeth, ready for the first pull of the load line to start the bite! It's the **AUTOMATIC** feature that enables it to outdig any other dragline bucket of equal size and weight.

Boost Production ... Keep America Strong



New Type Package

**Gives Information
on Use of Graphite**

BROADER UNDERSTANDING of the techniques of using graphites is furnished by new packages used by the Joseph Dixon Crucible Co., Jersey City, N. J. Eight large, clear, realistic pictures of pri-



mary uses of the firm's dry lubricating flake graphites are carried on the new containers. Attached to the back panel is a 13-page booklet titled, "New Graphite Know-How Package." It explains numerous important applications of the product, including directions for using graphite in combination with other ingredients.

With both pictorial and descriptive information, the buyer thus learns how the graphite content can be used in a broad range of services and applications. It is the post-war plan of the manufacturer to extend this style of informative packaging to all their graphited oil and grease products.

★ ★ ★

"Alcan" Road Is Re-Named Alaska Military Highway

ALASKA MILITARY HIGHWAY is the new name for the 1,600-mile route linking the United States and Alaska, according to an announcement by Brig. Gen. James A. O'Connor, of the U. S. Army's Northwest Service Command. He explained, "We called it Alcan to include some mention of Canada. Yet Canadians themselves took the lead in urging us to name the road the Alaska Highway."

Boulevards or Backwoods POWER LUBRICATION "ON THE JOB!"



MODEL 2417-A—Economical unit that includes one high pressure and two low pressure air operated pumps for delivering pressure-gun lubricant, gear lubricant and motor oil directly from 100 pound drums. Eliminates necessity of transferring lubricant. Also includes two large drawers for special guns and adaptors.

ALEMITE PORTABLE SERVICE STATIONS

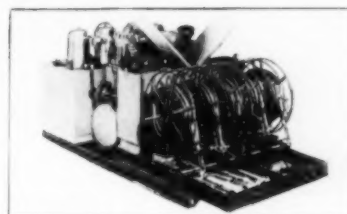
Save Time and Machines... Help You Get Jobs Finished Faster!

REGARDLESS of where a machine is, on a boulevard or forty-five miles from nowhere in the backwoods, dependable lubrication is an absolute necessity. That's why contractors with big jobs to finish fast, and expensive, irreplaceable equipment to protect, are using Alemite Portable Service Stations.

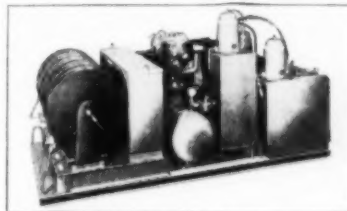
They are complete lubrication departments on wheels and include high and low pressure Alemite

Barrel Pumps, Alemite Motor Oil dispenser, hose reels, gas engine equipped air compressor. They can handle any lubrication need, anywhere—quickly and dependably.

New catalogs illustrating Alemite Portable Service Stations are now ready. Contain complete information on both standard and custom built models... and how this equipment can pay for itself in days! Mail the coupon, today, for your copies.



MODEL 2420—Includes two high pressure pumps and two low pressure pumps. Also a complete set of specialized guns and adaptors.



MODEL 2433—Includes one high pressure pump, two low pressure pumps and one motor oil pump.



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ALEMITE, 1840 Diversey Parkway, Chicago
Please send my FREE copies of your new Alemite Portable Service Station catalogs.

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Address.....
City..... State.....
Firm Name.....



HOW TO HELP KEEP YOUR MEN AT WORK!

A lot of today's sick-absenteeism starts with a sore throat or cold. Easily caught illnesses can spread through a group of workers through carelessness in the supplying of drinking water. The outlawed water bucket and dipper, passed from mouth to mouth, was a contagion carrier.

The modern water boy takes water to workers with a Dixie Portable Water carrier, serving each man with an individual paper cup. No danger of infection . . . used but once, these cups are then disposed of.

The Dixie Portable Water Carrier saves important time . . . for the men do not have to leave their work for water.

Write today for catalogues,
prices, complete information.

Just in Case . . .

Uncle Sam's armed forces and high-priority war plants are using so many of our paper cups that we may not always be able to supply certain sizes you may want. We'll do the best we can. Uncle Sam must come first. We're sure you'd want it to be that way.

Dixie and Vortex paper
cups are made at
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Ill., Darlington, S. C.,
and Toronto, Canada.



DIXIE CUPS

ONE OF THE VITAL HEALTH
DEFENSES OF AMERICA-AT-WAR

Combat Technique

(Continued from page 59)

lightly with pointed steel rods. When a mine was struck it was unearthed and its detonating mechanism removed.

With their hands protected from lacerations by heavy gloves, members of another platoon demonstrated the technique of setting up a barbed-wire entanglement. Two lines of steel stakes about 4 ft. high, with helical ends, were screwed down into the earth and between them wire was strung in a criss-cross pyramidal pattern. When the barrier of loosely strung wire had been completed the troops, shifting from a defensive to an offensive operation, illustrated how a barbed wire entanglement can be crossed in advancing on an enemy position. The largest and heaviest man of the platoon ran forward and made a flat dive, falling in a prone position across the web of barbed strands and depressing it so that the troops following him could cross on the run in single file by using as a stepping stone the broad back and buttocks of this self-sacrificing human bridge.

Camouflage Demonstration

The art of concealment by the use of modern methods and materials of camouflage, another specialty in the category of Engineer duties, was shown by several examples. Nets of both chicken wire and cordage, interwoven with strips of burlap of various colors to match the terrain and prevent the casting of shadows, are effective in protecting parked trucks, gun emplacements and other objects of military importance from enemy observation from the air. A seemingly harmless farm shed in a field suddenly collapsed to disclose a machine-gun nest. Another unsuspected gun position was covered by a camouflage net rigged on a hinged frame, like a buggy top, which was thrown back to enable the field piece to start firing.

The final act of the show displayed the skill of a large cast of trained Engineer troops in building sections of ponton bridges of two types, one using rubber rafts inflated by compressed air to support a plank roadway, and the other carried by long narrow barges upon which planking was set to form a military foot-bridge.

The troop demonstration illustrated realistically how the Army Engineers are trained and equipped not only to perform a wide range of technical services but also to engage effectively in actual front-line combat. The Corps of Engineers needs 100,000 qualified construction men in enlisted grades for the new fighting units now being organized and trained. Apply at any U. S. Army Engineer office.



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CENTRIFUGAL

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To reduce time out for repairing, overhauling or repainting your equipment . . . to put it back in service on war construction projects FASTER . . . try Oakite steam - detergent cleaning with the

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SOLUTION-LIFTING
STEAM GUN

Provides TRIPLE COMBINATION of heat, mechanical force and detergent action that removes oil, grease and muck in a jiffy! Cleans surfaces up to 12 feet high without pumps, motors or injectors. FREE, 24-page booklet gives complete details.

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NEWS FROM MANUFACTURERS *About Their Products*

The publications reviewed below, will keep you posted on latest developments in construction equipment and materials available for your use.

WELDER'S CHECK CHARTS—Hobart Bros., Hobart Square, Troy, Ohio. (Two 18x35-in. two-color wall charts) Illustrate and discuss three essentials of correct welding procedure: Correct electrode; correct travel speed; and correct welding current. First chart shows illustrations and characteristics of weld deposits from electrodes under various conditions, as well as speed in feet per hour that can be obtained in good weld using specific sizes of electrodes and how to cut rod waste and care for welding equipment. Other chart lists 19 Hobart electrodes and describes use and purpose of each grade. Also gives Alloy Metals Finding List of Hobart's Special Metals Data Service and list of sources.

★ ★ ★

MEET THE MECHLINS—Blackhawk Mfg. Co., Milwaukee, Wis. (12 pp., two color) Presents helpful suggestions for buyers and users of socket wrenches. Uses humorous illustrations with suggestions on extra utility, speed, and safety that modern wrenches bring to war work. Also gives suggestions for prolonging life of all hand tools. Introduces "Mechlins," second cousins of "Gremlins," as trouble makers for men who handle wrenches. Descriptions and antidotes for ten Mechlins are presented.



★ ★ ★

AIR PRESSURE—B. F. Goodrich Co., Akron, Ohio. (4-p. folder) Deals with air pressure, impact, and resistance to wear. Points out that properly inflated tires give maximum service from all stand points. Correct air pressure is minimum required to carry load.

★ ★ ★

SPOT AND SEAM WELDING OF LOW CARBON STEEL—American Welding Society, 33 West 39th St., New York City (4-p. booklet) Contains two charts for spot and seam welding, with explanation for use. Data compiled by canvassing about 60 fabricators of mild steel structures and resistance welding equipment manufacturers and intended to meet needs of Navy and War Departments and industries producing war material. Work was initiated by Resistance Welding Research Committee of Welding Research Council. Copies are available from Society at 10c. each.

Insure Against Delays with **DIAMOND Roller Chain DRIVES**

DIAMOND Roller Chains—used on all leading makes of construction machinery and equipment—provide definite operating- and cost-saving advantages.

- ★ **DIAMOND Roller Chain Drives** transfer *all* the power from your prime mover, without loss—they are 98% to 99% efficient.
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- ★ Maintenance expenses are low and when replacements or adjustments are needed, they can be made easily and with little or no dismantling.

DIAMOND pioneered the use of roller chain drives in the construction field and Diamond Chain performance has been proven on construction projects in all parts of the world. For new equipment or replacements, specify the roller chain with the "Diamond" on every link . . . **DIAMOND CHAIN & MFG. CO., 418 Kentucky Avenue, Indianapolis 7, Indiana.** Offices and Distributors in All Principal Cities.



There's room for only *One Sun*



THE barbaric Jap who rules by the bayonet is having his brief day of power over your Philippine land. This power, which reached its peak through shameful treachery, is on its way down. It will fall as surely as the bloody, dishonored sun-flag and the 30,000 Japs who sank beneath the Bismarck Sea!

We are one with you, Philippine brother, in the resolve that only one kindly sun shall remain above the Pacific. We are working and fighting toward that certain day.

As our forces fight, we work to give them weapons — tanks, planes, guns, ships. The materials to make these, every ton, must be won from the earth by determined men in mine and quarry. Their greatest weapon, in turn, is explosive force safely set free by Ensign-Bickford Safety Fuse and Primacord-Bickford Detonating Fuse. We manufacture this fuse with skill and care and pride — mindful of our responsibility to mining men, for VICTORY BEGINS UNDERGROUND!

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*This "tool of the times"
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No. 610 Util-A-Tool.
10-ton capacity. Pushes
apart or pulls in 4 3/4".
Wt. 74 lbs. in metal box.



The Simplex Util-A-Tool consists of 9 pieces of equipment used in various combinations to push, pull, tie forms, bind loads, clamp members for welding, etc.; bend beams and pipe, straighten bent structural members, etc.

TEMPLETON, KENLY & CO., Chicago (44)

Better, Safer Jacks Since 1899

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LEVER - SCREW - HYDRAULIC
Jacks

ELECTRIC VIBRATING EQUIPMENT—Jeffrey Mfg. Co., Columbus, Ohio. (176-p., two-color catalog) Explains basic design and operating principles of Jeffrey-Traylor Equipment, with technical information about its most common applications, including screening, feeding, conveying, cooling, drying, and packing. Divided into sections: (1) Feeders; (2) Waytrols; (3) bin valves; (4) conveyors; (5) dryers; (6) coolers; (7) packers; (8) screens; (9) electrical equipment; and (10) other equipment. Equipment handles over 300 different materials which vary in capacity from few ounces to 2,000 tons per hr., in size from one micron to 4-ft. cubes, in density from 4 lb. to 400 lb. per cu. ft., in moisture from dripping wet to bone dry, in temperature from 30 deg. below zero to 2,000 deg. F., and in hardness from wood flour to abrasives and glass cullet.

★ ★ ★



CREOSOTED WOOD PRODUCTS — Republic Creosoting Co., Merchants Bank Bldg., Indianapolis, Ind. (12 pp., illustrated) Contains information about flooring blocks, cross-arms, bridge, warehouse and shop flooring; lumber planking and beams; yellow pine piling, telephone, telegraph and transmission poles; fence posts, railroad and mine ties, and bridge, wharf and structural timbers. Describes work of Reilly Research Laboratories operated by company to improve, create, and develop superior creosoted wood products. Lists coal tar products manufactured by Reilly Tar & Chemical Corp., Republic associate. Lists some of war plants for which material is furnished by company.

★ ★ ★

PORTABLE ROTOR-LIFT GRAVEL PLANTS—Diamond Iron Works, Inc., Minneapolis, Minn. (10 pp., two color) Gives useful hints in selecting portable gravel plant, as well as step-by-step procedure in construction and operation. Contains flow charts and complete table of sizes and specifications, with illustrations of all parts and features.

★ ★ ★

PIPE TEMPLATES FOR WELDED FITTINGS—Air Reduction Co., 60 E. 42nd St., New York, N. Y. (12 pp., illustrated) Tells how to fabricate fittings for welded piping installations by flame cutting and welding. Shows how to draw up and use paper templates for flame cutting pipe to assure accurate, close fitting connections. Outlines methods for user to fabricate his own templates when advantageous.

★ ★ ★

OPERATOR'S INSTRUCTION MANUAL—Davey Compressor Co., Kent, Ohio. (44 pp., illustrated) Gives details on portable, industrial, Auto-Air, and Track-Air compressors, as well as full information on Davey split propeller heavy-duty truck power take-off. Includes complete supplement on operation and maintenance of pneumatic tools. Designed to instruct dealers and service men in operation, care, and maintenance of compressor units. Details of equipment are fully illustrated.



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WHEN these Army Air Force Bombers return from their mission over enemy targets, they must have a happy landing—runways that are long, wide and level.

Barber-Greene machines, in the hands of the Army Engineer Corps, are building those advance base runways faster and better—and on time! In every theatre of operation in the world, Barber-Greene runways are giving a fighting Army or Navy air force pilot a smooth take-off—his last feel of earth. Those runways first welcome him back, his mission successfully accomplished.

Runways built by Barber-Greene equipment speeded President Roosevelt, our Commander-in-Chief, to his momentous meeting with Prime Minister Churchill at Casablanca.

Standard B-G Asphalt Mixers, Finishers, Dryers, Loaders, tested and proved by many thousands of peacetime construction jobs, were ready when the Army needed them. Today, their production vastly increased, they are literally building the foundations for victory.

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Awarded August, 1942



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with variable reeving
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sturdy and long lived.

Hais has the right bucket for your particular job, engineered all the way to give you bigger pay-loads through improved design and construction. A Hais Bucket gives your crane a chance to break its own best performance records. Every Hais Clamshell is built to do its particular type of work better. Fifty years of skill and experience in manufacture back it up.

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139th St. & Canal Place, New York 51, N. Y.

HOW TO TEACH FIRE FIGHTING—Walter Kidde & Co., Inc., 140 Cedar St., New York City 6. (16 p., illustrated manual) Describes in simple terms classification of various types of fires, kind of extinguisher best suited to each, and methods of setting up demonstrations to teach proper use of each type. Designed to aid factory executives in instructing employees in fire-extinguishing techniques. Covers soda acid, water, loaded stream, foam, vaporizing liquid and carbon dioxide extinguishers.

★ ★ ★

ROLLER BEARING JAW CRUSHERS—Austin-Western Road Machinery Co., Aurora, Ill. (8 p., two-color) Clearly illustrates and explains all features of construction and operation. Includes large cross-section views of complete crushers, bearings, and other parts and gives comprehensive conception of detailed design and performance. Operational data, specifications and dimensions are arranged for ready reference. Known as Bulletin 1960.

★ ★ ★

CALCIUM CHLORIDE FOR DUSTPROOFING—Wyandotte Chemicals Corp. (two-color circular) Contains practical hints for application of material, as well as tables for determining rates of treatment. Said to help prevent chuckholes and frost heaving, eliminate sun glare, reduce cracks in play areas and reduce dust-borne bacteria. Used on roads, parking lots, airports, playgrounds, loading and delivery areas, storage piles of coal and coke, dirt floors in buildings, walks, drives, bridge paths, baseball diamonds, tennis courts, sand golf greens, race tracks and railroad rights-of-way.

★ ★ ★



CLIPPER SHOVELS—Buckeye Traction Ditcher Co., Findlay, Ohio. (24 pp., two-color) Pictures clipper convertible shovels, cranes, trench hoes, draglines and piledrivers on war and prewar jobs, with complete up-to-the-minute specifications. Takes clipper apart page by page and holds up each major part for minute inspection. Explains many advantages of "Mevac" vacuum

power control and describes in detail exclusive features resulting from its use, such as automatic swing brake and vacuum power dipper trip.

★ ★ ★

WAR USES OF HEAVY DUTY CONTAINERS—General Box Co., Chicago, Ill. (16 pp., illustrated) Tells story of new type of wire-bound container designed to combat hazards of overseas transit. Made from 3/8-in. re-sawn hardwood lumber, selected for strength to meet rigid specifications, box is wire-stitched to provide package of unusual stamina. Covers shipment of several vital war products that travel to fighting fronts in general heavy-duty boxes. Includes shipping hints on how to pack products to be sure they will arrive in perfect condition.



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under all conditions**

Contractors standardizing on Gorman-Rupp Pumps are getting extra hours instead of costly shut-downs due to pump failures. There's a DEFINITE REASON. More dependable. No priming jet to clog. No control valve to jam. This is important today when every piece of equipment has to take a beating. Let your distributor show you why more contractors are switching to Gorman-Rupp's every day.

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DROP FORGED
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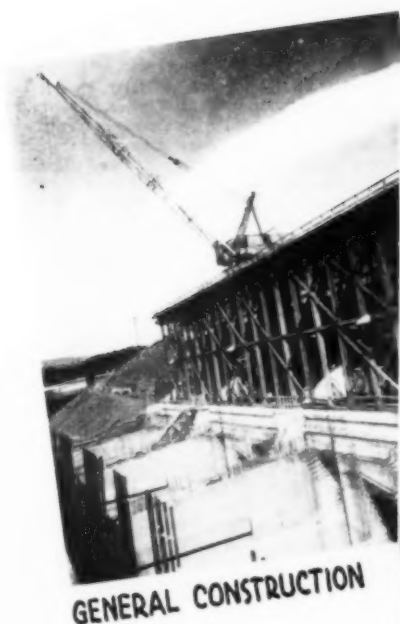
The ARMSTRONG Reversible Ratchet Construction Wrenches are made of steel thruout—the Ratchets are drop forged, the Nut Socket machined from special analysis bar steel. All parts except the handle are hardened. The spindle of the Ratchet is of "wide open" design—permits bolt to pass thru the Ratchet so that nuts can be run any distance along bolt and securely set with one setting. 24" or 36" Ratchets take square or hexagonal sockets for nuts of from 1" to 2 1/4" dia. or 1 1/2" to 3 1/2" dia., respectively.

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MATERIALS HANDLING

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★ Here is a kind of versatility that means time and money savings in general construction uses — that reduces material handling costs at industrial plants — that is helping in making possible better than ever before shipbuilding records.

Although standard machines, each model is designed to fit the particular needs of the service.

Contractors who are faced with unusual construction problems will find that a CLYDE Whirley has the versatility and efficiency to do the best kind of job.

CLYDE Whirleys are RIGHT too for material handling. They have large rail circles, light alloy booms, and a balanced design that allows greater loads with less counterweight. All mechanism for hoisting, swinging and traveling is specially designed.

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Our new booklet on CLYDE Whirleys is ready for distribution—get your copy—see the many uses for this modern machine—read the construction details—check their many advantages.



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IN ACTION on the biggest construction jobs and contracts of every size throughout the nation, these favorite work hats keep men on the job by keeping heads safe. Skullgard's laminated bakelite construction, one-piece molded, provides durability and resistance to impact proved by years of hard service—comfort proved by the greatest popularity enjoyed by any protective hat. 8 different models to choose from!



Type K—standard of the industry. Trim "doughboy" shape for all-around protection.

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ARC WELDING ACCESSORIES—General Electric Co., Schenectady, N. Y. (36 pp., illustrated) Comprehensively describes all standard and new arc-welding accessories now available. Features full line of chrome leather, asbestos, and flameproofed-duck protective clothing for men and women operators. Ranging from gloves and sleevelets to complete ensembles, it is designed for comfort, sturdily constructed and offers fullest possible protection to wearer. Also illustrates and describes ventilated helmets and head protectors, observation shields, electrode holders, and miscellaneous welding equipment, such as slag chippers, electrode carriers, and fillet weld gages. Also lists standard sets of welding accessories and renewal parts.

★ ★ ★

INTERNAL DEGREASING AND DRYING—Circo Products Co., 2835 Chester Ave., Cleveland, Ohio (4 pp., illustrated) Describes new Model 35-S Dee Tee vapor cleaner, designed for cleaning and thawing of differential, transmission and transfer cases of War Department motor vehicles. Permits servicing as many as five housings at one time and complete job can be done in 7 to 10 min. Also makes smaller model which is portable and electrically heated.

★ ★ ★

INDUSTRY'S MAGIC CARPET—Kerlow Steel Flooring Co., 222 Culver Ave., Jersey City (5), N. J. (24-p. catalog) Contains unusual



presentation of open steel flooring, gratings, and safety steps. Features large illustrations that clearly show proportions and construction of many different designs of open steel flooring, with graphic explanations of their advantages. Installation views show application of open steel flooring in large variety of industries. Also shows its use for special purposes, as armored flooring, bridge paving, powerhouse floors, marine engine room floors and safety steps, and sidewalk gratings. Standard safe load table and sketch of typical floor plan, with complete dimensions of various types of flooring and safety steps, will assist builders to select and lay out flooring for individual requirements.

★ ★ ★

TIRE LOADS AND INFLATION—B. F. Goodrich Co., Akron, Ohio. (Two-color wall chart) Gives truck and bus tire load and inflation table for highway users, based on Tire and Rim Association Standards. Also carries table for extra ply tires and one showing effect of load and speed on tire service.

★ ★ ★

DRAGLINER—Daniels-Murtaugh Co., 625 C Ave., Cedar Rapids, Iowa. (8 pp., illustrated) Describes unit said to provide speedier digging, faster filling, and quicker unloading. Fitted with arch of unusual height and shape to provide opening of maximum proportions for unobstructed entry of material when loading and fast discharge when dumping, to prevent bucket from hitting on upper portion of arch when dropped, and to provide maximum resistance to bending and wear.



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Cranes, shovels and draglines are giving support to the war effort in many different capacities. The illustration above shows a LIMA Crane equipped with a 55' boom and a lifting magnet loading scrap metal into cars destined for some plant where the scrap will soon be coming out in the form of tanks, trucks, guns, and other implements of war. LIMA Cranes are especially adapted to this type of material handling work where continuous operation, ease of handling and ability to maneuver in close quarters are essential. Independent clutches, which make it possible to hoist, swing, travel and boom up or down at the same time; extra large drums for long cable life; helical cut gears for smooth, quiet operation and anti-friction bearings throughout, which reduce friction to a minimum are advantages that make extra capacity possible. Be sure to include LIMA in your forward planning.

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More and more users are depending on Vulcan to get their pile driving requirements done more quickly and get a faster start on construction.

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Rugged strength—simple design—positive action—durability—compactness are all important features.

The open type fits the same leads and uses the same accessories as the Vulcan Single-Acting Pile Hammer.



Sizes
18C—30C—50C—80C
meet all needs

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WAR PRODUCTION—Gar Wood Industries, Inc.
Detroit, Mich. (48 pp., two color) Tells historical and pertinent facts about seven divisions and how Gar Wood products and equipment dovetail into present war production program. Included among its products are gun mounts, barrage balloon winches, wire reels, troop and cargo bodies, mobile machine shop bodies, truck and trailer equipment, dump bodies and hydraulic hoists, load-packers, winches, cranes, derricks, testing equipment, refueling and water tanks, fast, powerful boats for Army and Navy, and road machinery, including scrapers, bulldozers, roadbuilders, tamping rollers, and rippers. Divisions covered are: hoist and body; winch and crane; road machinery; tank; heating; boat; and gun carriage.

★ ★ ★

SIMPLIFIED SPECIFICATION SHEETS—S. G. Taylor Chain Co., Hammond, Ind. Forms on which all dimensions and fittings for single and double sling chains can be easily and accurately recorded for orders and estimate. Provide plain and simple drawings with spaces for fill-ins and are made out in duplicate. Every detail of measurement and fitting is quickly and easily covered to eliminate misunderstanding and error.

★ ★ ★

COPPER AND BRASS IN THE WAR—Copper & Brass Research Assn., 420 Lexington Ave., New York City. (36 pp., illustrated) Portrays importance of metals to winning war. All copper mine output records are being broken to supply fabricating plants which are operating 24 hr. a day turning out war armament and ammunition. Features activities of Army, Navy, Marines, Coast Guard and Air Corps.

★ ★ ★

PRECISION LATHES—South Bend Lathe Works, South Bend, Ind. (12 pp., illustrated) Describes Models A, B, and C 9-in. precision bench lathes. Special features of Model A are quick-change gear box, through which it threads and feeds instantly, and automatic apron. Model B also has automatic apron with worm drive and friction clutch for operating automatic power cross-feeds and longitudinal feeds. Made in Model A, B, and C, are 9-in. 12-speed horizontal motor-driven precision bench lathes and 9-in. underneath motor-driven precision lathes. Specifications given for all models cover capacity of lathe, spindle speeds, threads and feeds, headstock, compound rest, tool post, tailstock, and motor.



★ ★ ★

NEW PARTS FROM OLD—International Nickel Co., Inc., 67 Wall St., New York City. (8 pp., illustrated) Describes four different methods for renewing worn metal parts such as pump rods and shafts. Using a worn pump shaft as a practical example, it explains and illustrates step-by-step procedures for reconditioning the shaft by machining and refinishing the worn section; by building up and refinishing the section by welding; by metal spraying; and by heavy and hard electro-deposition.

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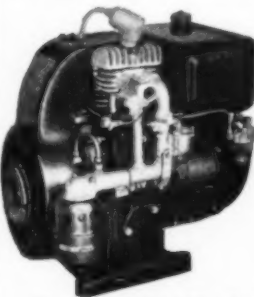


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ONAN GASOLINE DRIVEN ELECTRIC PLANTS provide electricity for construction projects remote from commercial power sources, and for emergency and standby service.

Thousands of these reliable, sturdy plants are doing a winning job on all the fighting fronts, providing electricity for many vital war tasks.

Ratings from 350 to 35,000 watts. A.C. 50 to 800 cycles, 110 to 660 volts. D.C. 6 to 4000 volts. Also dual A.C. and D.C. models. Air or water cooled.



Details gladly furnished on your present or past - war need for Electric Plants.

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1646 Royalton Ave., Minneapolis, Minn.

PRINT MAKING AND PROCESSING—Paragon-Revolute Corp., Rochester, N. Y. (44-p. handbook) Covers use of blueprints, direct process prints, sepia prints, and reproduced tracings, listing advantages of each. Describes uses to which various types of prints are most adaptable and methods by which they may be obtained. Comparative advantages of various methods of print making, of continuous yardage production as opposed to cut sheet printing, and of different types of processing equipment are given in detailed form. Revolving contact principle of printing is thoroughly discussed, as well as different types of lamps used for exposing sensitized materials. Several new features to be included on Model 3H are presented for first time, including squeegees placed before and after chemical bath to minimize tendency for water to cling to paper and dilute chemicals when operating at high speeds and quick-change chemical applicator which can serve as additional water wash. One section is devoted to reproduced tracings, telling how and where they are used, how they are made and equipment used.

★ ★ ★

All-Electric Oil Rig

(Continued from page 80)

able-speed motor connected through a gear unit. The two mud pumps each employ two 150-hp. variable-speed gas-protected motors, connected by V-belt to their respective power pumps. Two of these motors are Westinghouse gas-protected, variable-speed, slip-ring motors rated at 440 v., three-phase, 60-cycle, 860 rpm. Two other similar motors of 200 hp. each power the draw-works drive.

Maximum Speed Flexibility

The rotary table motor is designed to afford maximum speed flexibility during drilling. A maximum torque of $4\frac{1}{2}$ times full load torque is built into the motor so that extra capacity is available to break out either a stuck pipe or a plugged bit. The rotary table motor is rated 125/250 hp., which serves to give better speed regulation over the entire operating range. Sealed sleeve bearings and special insulation help protect motors against moisture, oil, dust, grit, and mild chemicals which are present.

Previous operations in this field, long since abandoned by major operators, were launched by Edward Doheney, pioneer oil man of the 1890's. In the last 50 years more than 50,000,000 bbl. of crude oil have been taken out at the 1,000 to 3,000-ft. levels. Shell engineers hope to strike the Deep Sand or 9,000-ft. horizon, which geologists claim is rich in oil. The entire horizon is Miocene. If the in-

(Continued on page 108)

FORM-TY ENGINEERING FACTS

OVER 65 TYPES OF JOBS	MORE THAN 100 TYPES OF DEVICES									
	Form Ty	Plan Ty	Vertical Form Ty	Clamped Anchor Log	Standard Anchor Board	A.C. Form-Ty	Slip-Ty	Ty Hangers	Form Hangers	Form Ty
BIKE										
Low Wall Storage	10-11									
High Wall Storage	10-11	10-11								
BRIDGE										
Arch Open	10-11									
Arch Wall	10-11									
Beam Type	10-11									
Bridge Deck—Beam Concrete	10-11									
Bridge Deck—Steel Frame	10-11									
Curbed—Small	10-11									
Curbed—Large	10-11									
Box Type	10-11									
Rigid Frame	10-11									
Spanned Beam Piers	10-11									
BUILDINGS										
Architectural Concrete	10-11									
Reinforced Concrete Frame	10-11									
Structural Steel Frame	10-11									
DAIRY PRODUCTS										
Cooling	10-11									
Cooling Walls	10-11									
Gate Structures	10-11									
Arch Roofs	10-11									
Buttress Dams	10-11									
Gravity Dams	10-11									
Power House	10-11									
Tunnels	10-11									
DOCKS AND PIERS										
Quarantine Wall	10-11									
Concrete on Steel Frame	10-11									
Concrete on Steel Frame	10-11									
Reinforced Concrete	10-11									
DRYDOCKS AND SHIPWAYS										
Accessories Buildings	10-11									
Beam Walls	10-11									
Dock Walls	10-11									
Piers	10-11									
Pump House	10-11									
Locks	10-11									
FACING WALLS										
On Rock	10-11									
On Concrete	10-11									
FRIDGE WALLS										

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More Types of
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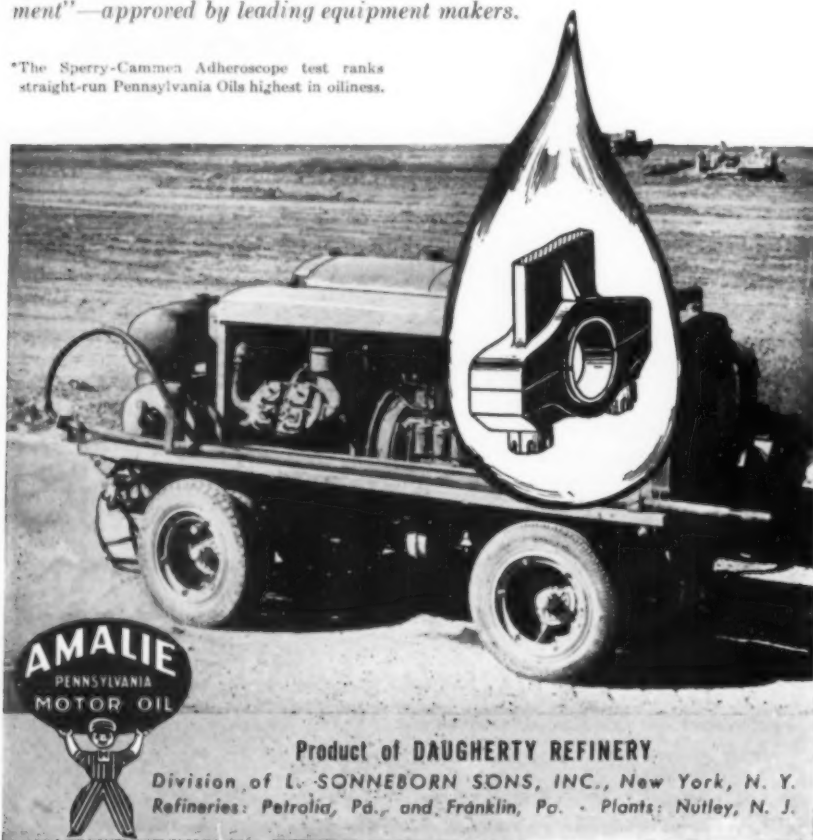


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Division of **L. SONNEBORN SONS, INC.**, New York, N. Y.
Refineries: Petrolia, Pa., and Franklin, Pa. • Plants: Nutley, N. J.

(Continued from page 107)

initial drilling venture is successful at the deeper level, Shell plans to slant-drill the entire field from a central location inside a building of modern architecture.

Location of this rig in the heart of a residential and recreational section, Shell engineers said, imposed problems seldom encountered in drilling. The all-electric drive has gone far to eliminate noise, odor and vibration. The composition board and rock wool covering of the 136-ft. derrick aids in eliminating these objections and in providing fire protection. As a further precaution against fire and explosion hazards, all apparatus is gas-protected so that possible escape of gases will not come in contact with "live" or arcing parts of equipment.

★ ★ ★

Synthetic Rubber Plants

(Continued from page 55)

ity operation, of perhaps 15c. a pound for buna-S. Production above rated capacity might even make a lower selling price possible. Without some form of Government aid or control, even the lowest attainable price hardly could compete with that of plantation rubber from the Far East, which formerly was laid down on West Coast docks at about 5c. a pound.

Selling price of butyl rubber during the first part of the program has been set by the Rubber Reserve Co. at a lower figure, less than 35c. a pound. This price, too, should undergo reduction as the butyl plants attain full production.

Construction Equipment

Quantities of metal required by each of the four plants visited ranged from about 2,000 to 20,000 tons. Process piping in the plants varied from about 25 to 115 carloads. Welding of this pipe and of other metal units was an important factor in the construction operations. Each job maintained from 20 to 30 welding machines in constant use. Volume of welding cannot be stated accurately in relation to total metal tonnage, but it can be said that the job which erected 20,000 tons of metal (plus or minus 10 percent) consumed about 12 tons of welding electrodes.

For erection of structures and process

(Continued on page 110)



1. **Teamwork!** Under the Papuan sun this ground crew team — and countless others like them — sweat together through endless hours of fatigue, short rations and malaria to “keep ‘em flying” for Victory. Timken, too, is all out for Victory. Day and night our factories roar that Peace may come sooner to the world. Day and night Timken is producing more axles, brakes and other important parts vital to war transportation and our fighting forces.

2. **Farmer urges teamwork.** “I am a dirt farmer and a fruit grower,” says W. K. Bristol, Almont, Michigan. “I know how necessary it is to Victory to keep all farm trucks and tractors operating. Teamwork between farmers, equipment dealers and mechanics is the only way to accomplish this end. It has been rightly and authoritatively stated that Food will win the war and write the peace. Extra-good care of equipment is our first duty.”

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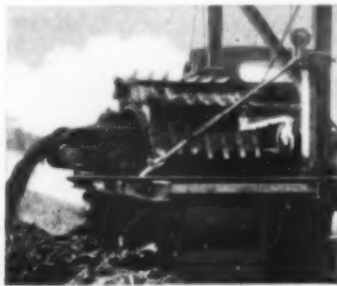
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Hungry for yardage

YOU CAN SEE what these ditcher teeth are up against! Trenching in sandy soil! Yet, because of their abrasion-defying hard-facing of



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And at a surprisingly low cost,—in comparison both with new teeth replacements and with other hard-facing materials. Here, the saving over the hard-facing material formerly used was 40%!

COAST METALS HARD-FACING is your best answer to tough maintenance problems. Applied to road graders, levelers, bulldozers, slip scrapers,—in fact to all blades, cutters and scoops on equipment of this type for cutting, scraping, digging and loading earth, it makes your equipment last several times longer.

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UNIT with V-BELT
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This speedy Reliance Portable Unit can be used with equal profit — 1st — as a Crusher alone, or — 2nd — in combination with Elevator, Chute, Screen, etc. Note the low feed opening at a safe distance from the balance wheels. Note the reliable power-producing V-Belt Drive. Note the low center of gravity for stability. For strength, simplicity and economy you can't beat this or any other Reliance.

• OTHER PRODUCTS — Reliance offers a complete line of Rock Crushers; Bucket Elevators; Revolving Screens; Storage Bins; Pulverizers; Chip Spreaders; Heating Kettles, Bin Gates; Feeders; Belt Conveyors; Grizzlies; Air Separators; Sand and Gravel Spreaders; Wash Boxes.

UNIVERSAL ROAD MACHINERY CO.

Kingston, N. Y., U. S. A.

DISTRIBUTORS IN ALL PRINCIPAL CITIES OF U. S. A.

(Continued from page 108)

equipment, all four jobs made use of crawler cranes, gin poles, guy derrick and versatile and indispensable oil-field winch trucks, equipped at the rear end with welded, tubular A-frame hoisting booms. Where necessary in erecting tall, vertical pressure vessels and towers, guy derricks were set in an elevated position on steel frames.

Grading at the various sites was not a major item, although it did run up to 90,000 cu. yd. and 125,000 cu. yd. for two of the plants. Depending upon location and conditions, grade was prepared by hydraulic dredges, tractor-scrappers, tractor-bulldozers, power excavators equipped as draglines or clamshell cranes, and earth-hauling trucks. Draglines and clamshells also served in digging trenches for the underground utilities, as well as foundation excavations for concrete footings.

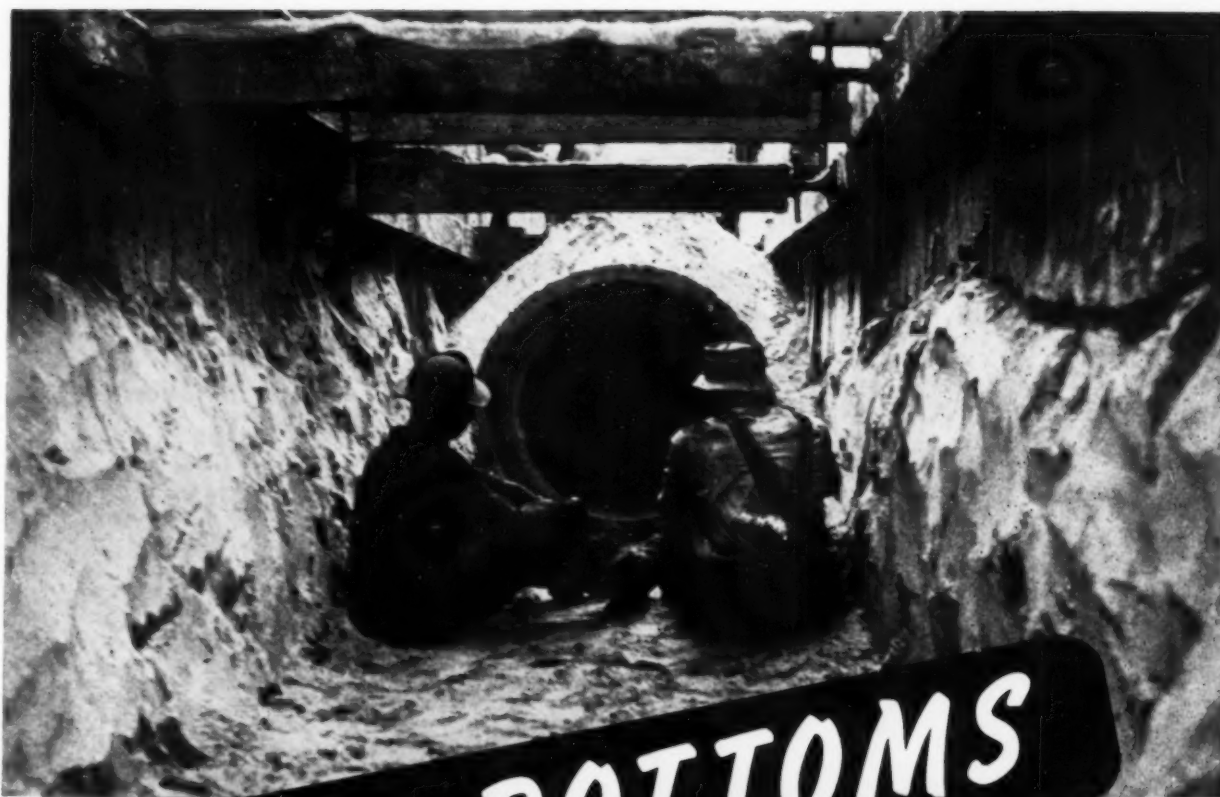
Concrete quantities for the various jobs ranged from about 14,000 to 30,000 cu. yd. An average day's concreting did not amount to much more than 200 yd., although certain foundation mats under compressor houses and distillation towers sometimes required continuous concrete placement of 1,000 yd. in each of several mat units. In general, all the jobs made use of a combination of job mixing plants and outside mixing plants to supply ready-mixed concrete hauled by truck-mixers of either the closed-drum or open bathtub type.

Welding Tests

Because of the importance of the welding work, bearing directly on trouble-free operation of the plants, welders were subjected to severe tests, and all welded connections, whether shop fabricated or field-made, were given close inspection either by radiograph in the shop or visually on the job. Any welds giving indication of doubtful qualities, were tested by having coupons cut from them for breaking in a tensile testing machine. Coupons likewise were cut at random from welded joints made on the job to maintain a high standard of workmanship on the part of the welders. Every welder stamped his code number on the pipe alongside each weld.

Nearly all the overhead process piping was carbon steel, with some stainless steel and other types used where required, in sizes ranging from the smallest to about 30-in., 36-in. and 42-in. I. D. Seamless pipe was widely used in sizes up to 24-in., and the larger diameters were fabricated with welded longitudinal seams. At the pipe connections the welds were built up by re-

(Continued on page 112)



DRY BOTTOMS

First they thought the equipment they had would do.

Next, another type was wished on them.

Then they patched the two together

It was still Delay, Linger and Wait.

The unforgiving minutes were slipping away.

Time was still of the fateful essence.

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For semi-trailer mounting, this unit is available in capacities from 95 to 120 barrels. Twin screws unload the cement at controlled speeds.

BUTLER BIN COMPANY
WAUKESHA WISCONSIN

(Continued from page 110)
peated passes in V-butt joints, the angle of the V being specified in accordance with the wall thickness of the pipe.

Labor Supply

On the whole, relations with craft unions were good, and no delays of any consequence were caused by difficulties with the unions. Absenteeism and high labor turnover, however, seriously affected the smooth progress of operation at all four plants, although these factors were not in excess of what has been reported generally from centers of great industrial activity.

All of the jobs operated a minimum of six days a week and worked seven days during periods of maximum progress when deliveries of equipment and materials permitted seven-day operation. At least one of the projects remained steadily on a seven-day schedule. Figures on absenteeism and labor turnover for this job are fairly representative of all. The overall average figure for absences from work each day was 13 percent, and the labor turnover ranged roughly between 1 and 2 percent per day. To keep an average of 1,200 mechanics and laborers employed on this job during the course of one year required for construction, the contractor hired 4,500 men.

★ ★ ★

New

Butadiene Unit

(Continued from page 57)

jobs under construction simultaneously by the same contractor amounted to about 20,000 cu. yd., of which probably one-third went into the butadiene plant. This project differed from all others described in the various sections of these notes in that it did not have a concrete mixing plant on the job. The ready-mixed concrete was supplied under subcontract by a commercial firm, the Anderson-Dunham Concrete Co., Inc., Baton Rouge. The subcontractor had in operation at the time two job mixing plants at the sites of other industrial construction projects within less than a mile of the butadiene area, in addition to a permanent commercial plant less than 2 mi. away. A large portion of the ready-mixed

(Continued on page 114)

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is WON**



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IF YOU will chart the service record of Preformed "HERCULES" (Red-Strand) Wire Rope — as so many have done — you, too, will have definite proof of the savings that its use provides.

You will find a saving in steel because of its longer life; by the same token you also save time, as replacements are less frequent. And the sum of the two savings is greater economy.

The consistent top-flight performance of Preformed "HERCULES" (Red-Strand) Wire Rope is not a matter of chance. Like all wire rope bearing this well-known name, it is made of acid open-hearth steel wire . . . selected by rigid tests to make sure that it meets our exacting requirements. It is then carefully manufactured according to sound fundamental principles.

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As broken wires lie practically flat, they are not so apt to injure hands of the men handling it. Also, there is less possibility of an "out of place" wire causing damage to adjacent wires in the rope.

2
It is not so easily kinked.

3
Its inert qualities make for smoother spooling and easier handling.

4
The preforming process minimizes the tendency of Lang's Lay wire rope to loop or squirm.

5
There is less turning and twisting of the rope in the grooves, and less internal movement of the wires and strands—all of which tends to reduce both external and internal wear, thereby insuring longer service.

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(Continued from page 112)

concrete was hauled from the commercial plant, and the remainder came from the two nearby job plants, concrete placing operations at the three sites being regulated to permit flexibility in using the subcontractor's hauling fleet. Jaeger and Rex truck-mixers, most of them of 2-yd. capacity and some of 4-yd., transported the ready-mixed concrete.

For a period of about two months, the quantity of concrete placed each day at the butadiene plant equalled or exceeded 100 cu. yd.

Structural Steel

To speed the sorting and erection of structural steel, the contractor had the fabricating shops paint the structural material in different colors in accordance with a scheme which utilized a separate color for each of the various sections of the plant. In addition, each piece of steel was marked to indicate its final position in the structure. By this means, classification and distribution of steel was simplified upon arrival of carload shipments at the site, and erection was greatly expedited.

Process Equipment

As on all the projects in the synthetic rubber program, prefabrication was extensively employed for the process pipe lines. Only straight lengths used in the long pipe bands of the plant were shipped directly from the pipe mills to the job. All specials were prefabricated. The pipe was mostly carbon steel, and all sizes up to 24-in. I.D. were seamless tubing. The greater part was standard pipe, but some was extra heavy.

Vapor tubes in larger sizes, 30-, 36- and 42-in., were prefabricated with welded longitudinal seams by the Buffalo Tank Co. Almost the only alloy steel pipe used on the job was in the tubes of the superheater furnaces. Five gas-fired upshot furnaces, incorporating features of Universal Oil Products design, were erected on the job to superheat steam received from a central boiler station, likewise constructed by the E. B. Badger & Sons Co.

Six 6,000-bbl. Hortonspheres for storage of feed stock, intermediate stock and finished product were erected at the site of the tank farm by the Chicago Bridge & Iron Co. The same subcontractor installed the reactors in the butadiene plant.

In common with all other plants producing feed stocks for manufacture of synthetic rubber, the butadiene unit requires a large volume of cooling water. Water is needed for cooling the jackets of the compressors used to liquefy process vapors and ammonia vapors, where re-

(Continued on page 116)



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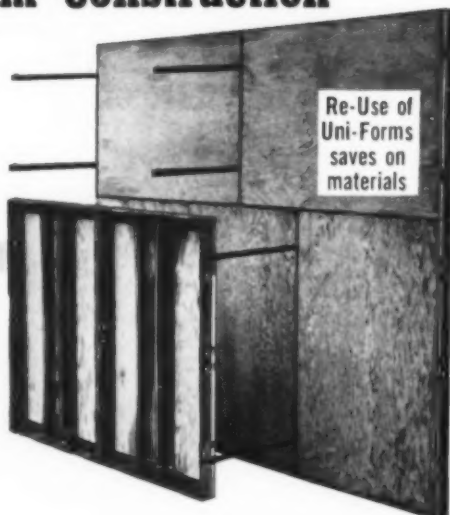
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(Continued from page 114)

frigeration is employed in the process. Nearly all distillation equipment requires cooling at the tops of the towers. Steam for heating enters the bottom of the tower, and water is used for cooling the vapors at the top. Many of the heat exchangers incorporated in the process lines are really condensers, and water is used as the cooling medium in these units.

At the butadiene plant and adjacent plants in the same area, most of the cooling tower makeup water is clarified river water brought in by pipe lines from the nearest large stream. To cool the water used by the butadiene plant, a large cooling tower of Marley induced-draft type was constructed of California redwood. Three steam-turbine-driven Byron-Jackson 16-in. 12,000-gpm. pumps handle the water at the cooling tower.

Progress

Construction of the butadiene plant started late in the spring of last year, and initial operation involving the preparation of feed stock and the making of solvent began less than 12 months later. Production of butadiene for shipment has been in full swing since May.

Construction proceeded on a schedule of one shift a day, seven days a week. Speed of operations was regulated to correspond with receipt of critical equipment and materials. At the start, the plant was scheduled to be completed in 12 months, but, at the request of the authorities, this schedule later was shortened to ten months, dependent upon deliveries to the job. When it was found that deliveries could not be made at the accelerated pace, progress charts had to be adjusted to the original 12-month basis.

Delivery schedules did not permit operation on a 7-day schedule at the beginning of the job. Work started with an 8-hr. shift, 6 days a week. As materials and equipment began to arrive in needed volume, the shift was lengthened to 9 hr. and then 10 hr. With a pickup in deliveries, the job promptly went to a 7-day week, and the crews worked more than

10 hr. a day when materials were available to make the longer hours feasible.

Supervision

As architect-engineer for the Defense Plant Corp., the Standard Oil Development Co. worked out the process design and did a portion of the mechanical engineering for the butadiene plant. Both the Standard Oil Development Co. and the Standard Oil Co. of Louisiana, operator of the completed plant for the Rubber Reserve Co., are subsidiaries of the Standard Oil Co. (New Jersey). Layout and engineering, both structural and mechanical, were by E. B. Badger & Sons

(Continued on page 118)

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 **ARMCO**
TUNNEL LINER PLATES

(Continued from page 116)

Co., Boston, general contractor for DPC.

For DPC, general supervision of design and construction is under R. E. Burton, division engineer of the synthetic rubber division, Washington, D. C.; L. J. McHugh, division engineer, Baton Rouge, La.; and H. J. Malochee, supervising engineer at the site. The interests of the operating company are directly represented by R. D. Patch, assistant superintendent, reporting to J. P. Warner, superintendent, chemical products division, Standard Oil Co. of Louisiana. For E. B. Badger & Sons Co., all work on the job is managed and directed by M. E. McMurry, construction superintendent. D. B. Evans is job engineer for the general contractor.

(A second article on plant construction for the Government's synthetic rubber program will appear in an early issue.)

★ ★ ★

Army Engineers in North Africa

(Continued from page 79)

dromes in country devoid of transportation facilities is being accomplished by the use of air-borne Aviation Engineer units and equipment. Engineers, with special equipment designed for transportation in cargo aircraft or gliders, were landed in North Africa at the beginning of the campaign. When it became necessary to establish advance airdromes to support the action in Tunisia, cargo planes were dispatched to pick them up. The companies, with their equipment, were flown approximately 1,000 mi. to points as close as possible to the sites selected for the airdromes. They marched to these sites and immediately went to work.


Runways Built in Three Days

Within three days after the call was sent to the Engineers, they had made the long trip and completed the preparation of runways at one site, and the first B-17 Flying Fortress bombardment planes had begun operations from the new field. A second field, which required more work, was ready on the following day. The first field was built with the Engineers' own air-borne equipment. To supplement it

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Ratchet Lever, Spur Geared, Electric
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on the second, they obtained the temporary use of some French road-building equipment.

Amphibian Engineers, who are in training for assaults on hostile shores, learn, through the use of wire mesh foundations, to build beach-head roads for heavy trucks in as little as 5 or 10 min. Carrying bulldozers which level off sand dunes on the beach, the Engineers unreel spools of heavy wire netting and throw sand on the netting to produce, in a few minutes, a road that will carry eight-wheeled trucks.

★ ★ ★

FACTORY BASEMENT

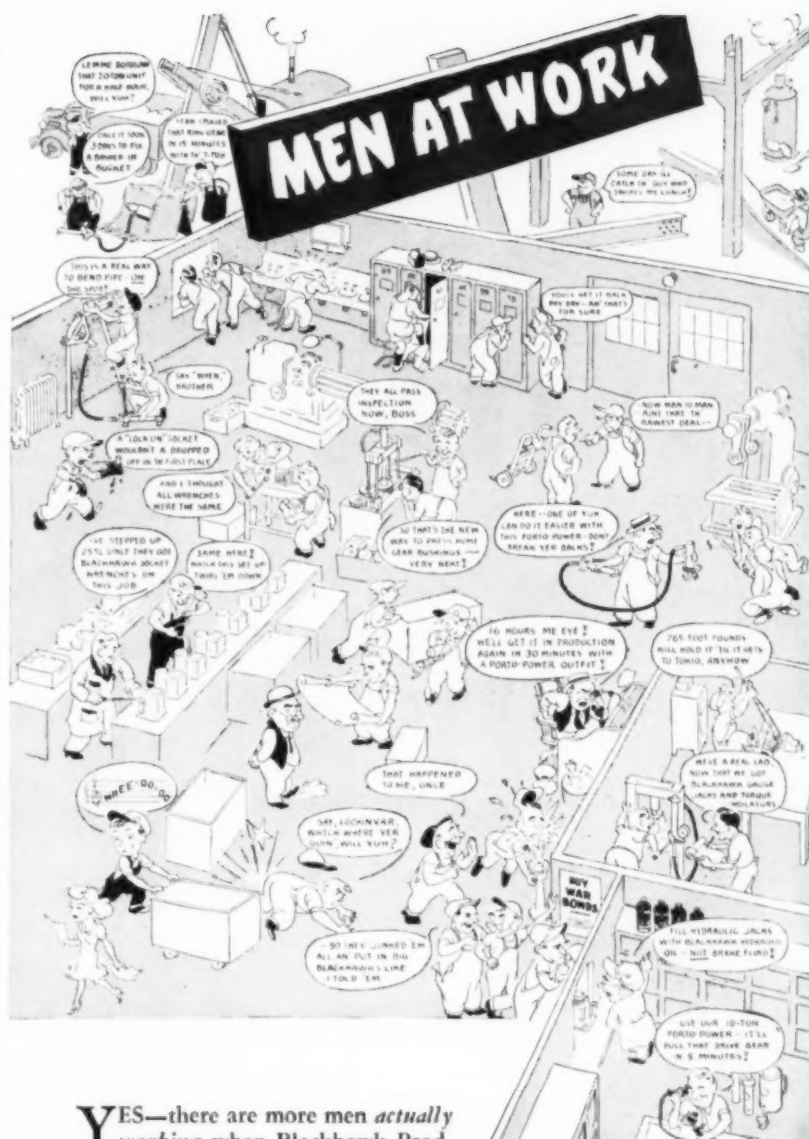
(Continued from page 64)

hanging in midair from the ends of the needlebeams, which now act as cantilever supports. At this stage of the work each needle-beam, carrying the load of one column at each end, is supported on its timber mat by the solid prism of unexcavated earth extending the length of the basement midway between the two rows of underpinned columns. The shovel loads into trucks which run up a ramp to ground level.

To supplement the work of the power shovel when operating close to newly set columns of the building and to avoid the risk of damage by an accidental blow from the shovel dipper, a tractor-bulldozer was used to push earth away from the columns and within reach of the dipper. In thus serving the shovel the bulldozer often had to operate up and down extremely steep earth slopes—so steep, in fact, that the tractor had difficulty in backing up to reach ground level. At such times the shovel operator lent a helping hand by skillfully swinging the dipper of his machine under the blade of the bulldozer and giving the latter a gentle push up the slope.

The earth in the basement area was a mixture of sand clay and shale which, when excavated, stood up at a steep slope. The lower 2 to 3 ft. was a ledge of brown sandstone. In undercutting the needed columns, therefore, the shovel was able to remove material to a point within 3 or 4 ft. of the ends of the 23-ft. long timber mats that supported the needle-beams. It was obviously desirable to do this excavation with a power shovel, not only on account of the quantity of

(Continued on page 120)



YES—there are more men *actually* working when Blackhawk Products are in the scene. And here's why...

Porto-Power (that "educated hydraulic jack") has kicked out a lot of dangerous old maintenance and construction methods on scores of jobs that not only tied up several men unnecessarily but wasted untold valuable hours.

Then there are Blackhawk Hand Jacks, Gauge-Equipped Hydraulic Jacks and Pipe Benders — doing miracles that were unheard of a few years ago. (Even the big 50-ton Jack is *one-man* operated, freeing extra men for other work!)

And as for Blackhawk Wrenches and Torque Indicators — each item is designed to give the user more speed, safety and efficiency. Exclusive features do the trick!

See your Blackhawk Industrial Supply Distributor for new bulletins on this equipment — or write us direct.

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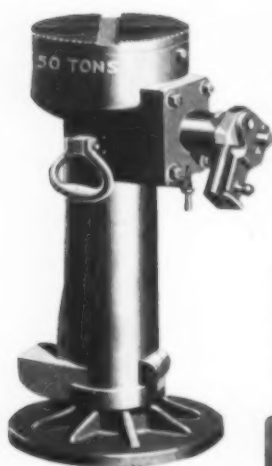
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ALL
THREE

Husky, easy-operating Duff-Norton Jacks get right in there where there's heavy lifting or lowering to be done. Convenient to carry from job to job, Duff-Nortons are quickly spotted under the load.

A wide range of Duff-Norton Jacks speed every job of lifting, lowering, pushing and pulling—providing "mechanical muscles" for the construction industry's heavy loads.



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THE DUFF-NORTON MANUFACTURING CO.
PITTSBURGH, PA.

Canadian Plant: COATICOOK, QUEBEC • District Representatives in Principal Cities

(Continued from page 119)

material involved, but also because of its character and the need for completing the job quickly.

Load Transfer

As the power shovel makes the first two earth cuts the full length of the basement area, each underpinned column is extended to a new concrete footing below the basement floor grade by bolting to its base a new section of 8 $\frac{5}{8}$ -in. O.D. concrete-filled pipe column of a length sufficient to provide a finished basement 10 ft. 6 in. below ground floor level. After all sixteen columns in the two rows have been thus extended, the wedges between the column brackets and the top flanges of the needle-beams are knocked out, thus transferring the load of the building through the lengthened columns to new concrete footings at basement grade. The column brackets are then burned off with a cutting torch and the long I-beam needles are removed, allowing the power shovel to make a third cut for removing the prism of earth between the two rows of lengthened columns. After the brackets had been burned off, the column surface was ground smooth with a carborundum disk over the area of the temporary welded connection.

At this stage there still remains near the opposite side of the building a third row of eight columns to be needed in order to permit completion of the basement excavation. On this row of columns the method of support is almost a duplication of that previously described. The only difference is that each needle-beam carries a column load at only one, instead of both, ends. The non-loaded end of each needle is anchored in a niche cut in the brick masonry wall of the factory building. Into each niche is inserted a steel plate against which the flange of the I-beam needle is tightly wedged. After the loads of the eight columns in the third row have been transferred to the needles the power shovel makes a fourth cut under the footings of the supported columns, which are then extended to new basement footings, as previously described. The needle-beams are then removed, allowing the power shovel to complete the excavation of the basement by a fifth and final cut.

Personnel

In charge of the underpinning work for Spencer, White & Prentiss, Inc. was Joseph C. Weaver, general superintendent, with Mike Canale as superintendent and Dominick Canale as general foreman. For the Turner Construction Co., general contractor for the factory building, M. J. Roach was engineer and Walter P. Jackson was project superintendent. The architect for the building was Louis S. Weeks, of New York.



NOTHING BEATS
"ON THE JOB"
 EXPERIENCE

READ WHAT A PUBLIC UTILITIES MAINTENANCE EXECUTIVE
 SAYS ABOUT A DAVEY COMPRESSOR THAT HAS ALREADY
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AS WE HAD NEVER SEEN THE INSIDE OF THIS COMPRESSOR, NEVER
 CHANGED A VALVE OR TOUCHED A BEARING, I HAD THE COMPRESSOR PULLED
 APART. I HAVE JUST RETURNED FROM INSPECTING ALL THE PARTS OF
 THIS COMPRESSOR. IN THE OPINION OF OUR
 AUTOMOTIVE EXPERTS AND MECHANICS WHO
 WORK ON COMPRESSORS, THIS MACHINE IS IN
 JUST AS GOOD, IF NOT BETTER CONDITION, THAN
 WHEN NEW — AND I CAN SEE NO REASON WHY
 IT SHOULD NOT LAST ANOTHER SEVEN YEARS=

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"It's a FIST-GRIP on Hitler's Throat... Saving Fighting Metal, Speeding the Job..."



"Yes, we use Laughlin 'Fist-Grip' Safety Clips," says this Super. "Three of them do the work of four U-bolts, and they don't crimp and injure wire rope that we want to re-use."

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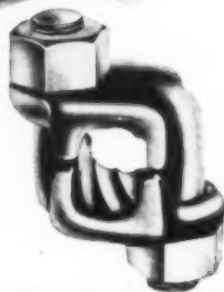
Saves Accidents — can't be put on wrong even by inexperienced men; doesn't weaken rope; greater holding power.

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**Greater holding power
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Hold rope in smooth, vise-like grip, with no reverse bends under load and no protruding threads to become battered and spoiled.

**THE THOMAS
LAUGHLIN
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PORTLAND, MAINE**



POST-WAR PLANS

(Continued from page 67)

According to the original prospectus for the committee's program as envisioned by the architects and approved by the contractors, engineers, material supply men and building trade unions, the organization aims first to stimulate and encourage public bodies and agencies to undertake immediate preparation of plans and specifications for prompt letting of contracts for construction of public works at the close of the war. The first need in starting this practical pre-planning work is to obtain adequate appropriations from the responsible governing groups in the city, county and state. Development of full plans and specifications for the large volume of public works needed in the area requires considerable sums of money, and sound arguments must be presented to the governing bodies to convince them of the necessity and advisability of starting the work now. That public officials are receptive to the idea is indicated by the action of the city council of Houston in making an initial appropriation of \$45,000 to undertake engineering and architectural studies and the preparation of plans and specifications for one project of relatively small size. The committee proposes to encourage this favorable trend.

Prospects for post-war construction in the Houston area are rosy. Enthusiastic local prognosticators point to a volume of \$500,000,000 in urgently needed and long discussed public works. Upon cold analysis, this volume shrinks to a much smaller figure, especially for the first two years after the war, when the sharpest employment problem must be met. Eliminating works of doubtful consummation, the total volume reduces to about \$300,000,000, much of it included in programs of 5- and 10-yr. duration. On a conservative basis for the first 2 yr., the volume of public works for which money appears to be in sight is about \$75,000,000; this figure includes \$50,000,000 for federal-aid state highways and urban improvements.

Building permits in Houston for the three years before the war averaged \$25,000,000 per year. Allowing an equal volume for the 2 yr. after the war and adding \$20,000,000 of construction deferred because of the war, the gross building expenditure may total \$70,000,000 in 24 months. According to the estimate of Loy W. Duddleston, secretary, the builders of the Houston AGC Chapter

can maintain normal operations on a building volume of \$20,000,000 to \$25,000,000 a year. This estimate is based on peace-time operations before the war.

As a result of war construction, the contractors have greatly enlarged their organizations, and the building trades unions have expanded their membership, as indicated by the growth of the carpenters' local from about 2,200 to 5,000. Additional construction to absorb this increase seems certain to occur after the war in the continued industrial development of the Houston area.

Industrial Growth

Houston is the center of a region of tremendous potentialities for industrial development. It provides the cheap fuel (natural gas), natural resources, rail and water transportation, climate and geographical location favorable to future industrial expansion. Many great industries are already located in the region, and a number of corporations are known to have acquired or selected sites for putting their first plants in the area.

This construction, in a broad sense, can be anticipated with confidence. It is impossible to say how long will be required to get specific projects started, but, on the basis of what is known, it can be stated that a number of large corporations plan to begin construction as soon as materials are released from war restrictions. Among the industries planning to build or enlarge plants are: iron, steel, oil (refineries, fields and pipe lines), chemicals, cellulose, electric power, meat packing, vegetable packing, vegetable oils and paper. Some of these industries, such as steel, will provide raw material for satellite industries, which are expected to develop coincidentally with the primary producers. All in all, the prospects for industrial construction, even on a conservative basis, appear to be excellent in the Houston area.

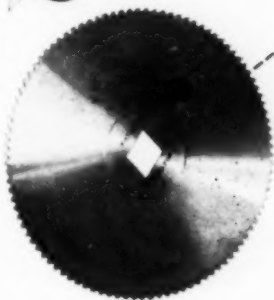
Commercial Construction

A fair proportion of plans for large commercial and institutional buildings was frozen on the boards of architects at about the time of Pearl Harbor. Many of these projects are expected to be revived when materials become available.

Stimulating Private Owners

The stimulating of advance plans and specifications on the part of private owners, both industrial and commercial, is left almost entirely to individual members of the architects', contractors' and producers' groups. The individual firms have long records of relationships with the private owners, and they are in a better position than any committee to sell the owners on the advantages of

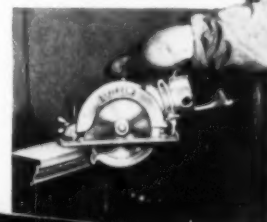
(Continued on page 124)



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FOR VICTORY BUY WAR BONDS



(Continued from page 123)

making plans now for post-war construction. The joint committee confines its efforts to convincing public bodies of the advisability of pre-planning for public works during the current lull, when the constituent branches of the construction industry (architects, engineers and contractors) are able to give full time and thorough study to all the problems involved.

★ ★ ★

PRESTRESSED CONCRETE TANKS

(Continued from page 73)

a project where the contractor built 23 fuel oil tanks (116-ft. inside diameter) of 60,000-bbl. capacity and five 27,000-bbl. diesel fuel tanks (100-ft. inside diameter). Most of the photographs and drawings which appear with these notes show work on this project. The contractor used plywood panel forms, mostly of 4x8-ft. size, for both faces of the tank walls. To facilitate concrete placing, each tank wall was separated by vertical construction joints into eight sections; four alternate sections were placed one day, and the remaining four on the following day. Form ties were installed when the panel forms for the inner surface were erected to full height around the entire circumference of the tank. Erection of exterior panels kept pace with the progress of concrete placement, which rose vertically at a rate of about 4 ft. per hr.

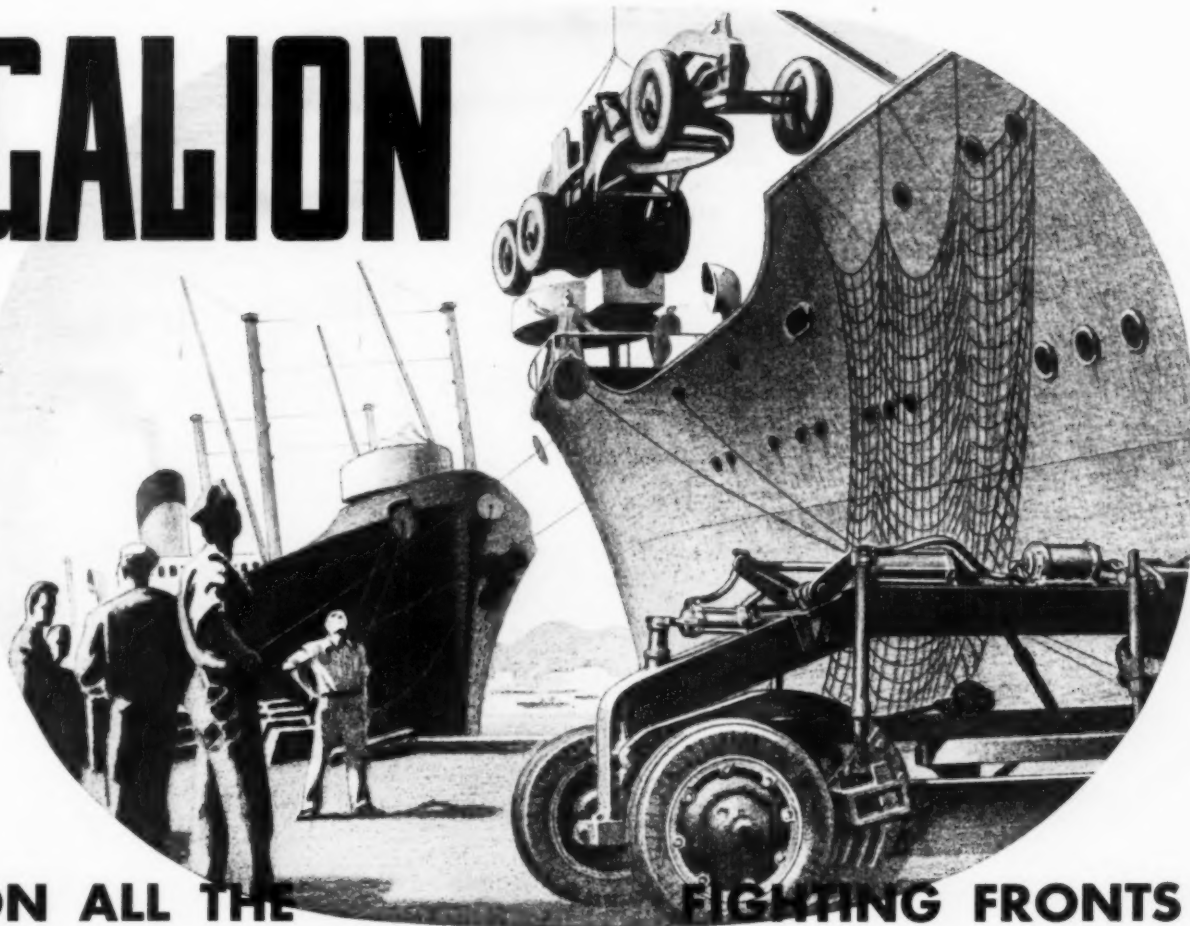
During the fastest progress made on the job concrete work on eleven 60,000-bbl. tanks was completed in two months to the day. Each tank required 10,000 yd. of earth excavation, 20,000 yd. of shale excavation, nearly 100 tons of temperature reinforcement, and almost 1,700 yd. of concrete. Drilling and excavating equipment was pushed hard to prepare the holes for the tanks on the rapid schedule; these units worked two 10-hr. shifts, but all other operations were on a 9-hr. basis.

Purpose of Prestressing

Two characteristics of concrete, porosity and shrinkage, ordinarily lessen its usefulness in containers for liquid fuels. When shrinkage occurs while the concrete is setting in the walls of a conventional reinforced-concrete tank, compressive stresses are set up in the

(Continued on page 126)

GALION



ON ALL THE FIGHTING FRONTS

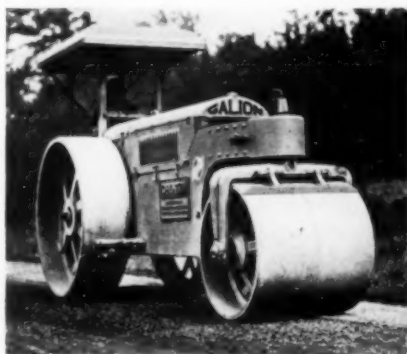
Yes . . . on all the far-flung battle fronts you'll find Galion graders and rollers playing an important part in the war drama. Operated by the Army and the Navy, dependable Galion equipment is backing up the combat units. Roads to be built and repaired, airfields to be constructed and maintained and shell holes to be filled. This requires rugged equipment . . . the kind that Galion builds.

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Motor Graders and Spreaders



*Now,
Let's Look at the Drum...*

Ransome

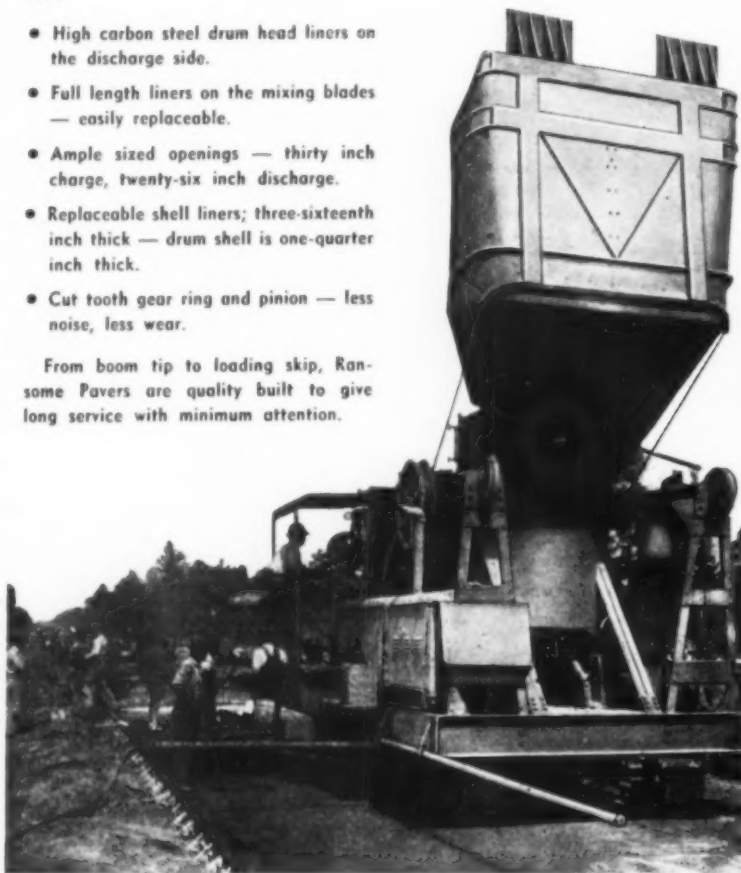
34-E DUAL DRUM PAVERS

When it comes to continual pounding punishment, a paver mixing drum must be able to take it.

The Ransome 34-E Dual Drum Paver Mixing Drum is equipped with

- High carbon steel drum head liners on the discharge side.
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- Ample sized openings — thirty inch charge, twenty-six inch discharge.
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From boom tip to loading skip, Ransome Pavers are quality built to give long service with minimum attention.



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(Continued from page 124)

steel. Later, as the tank is filled with liquid, a reversal of stress occurs as the steel takes up the tensile stresses which the design intended it to take. Resultant elongation of the walls causes the concrete to crack.

In a prestressed concrete tank the walls, as first constructed, contain only sufficient steel to resist temperature stresses. Load-carrying steel is added later in the form of circumferential band rods. These rods are equipped with turnbuckles by which they can be tightened to induce a measured tensile stress in the



SPECIAL HICKEY made to order by job blacksmith puts pressure against band rod being given initial tightening to snug fit at turnbuckle connection.

steel and a corresponding compressive stress in the concrete. The initial stress imparted to the rods is considerably less than the allowable working stress. As the tank is filled, with resulting deflection of the walls, compressive stresses in the concrete diminish, and tensile stresses in the rods increase. Theoretically, the circumferential rods are prestressed to a point which will result in zero stress in the concrete and a safe working load in the steel when the tank is filled to capacity.

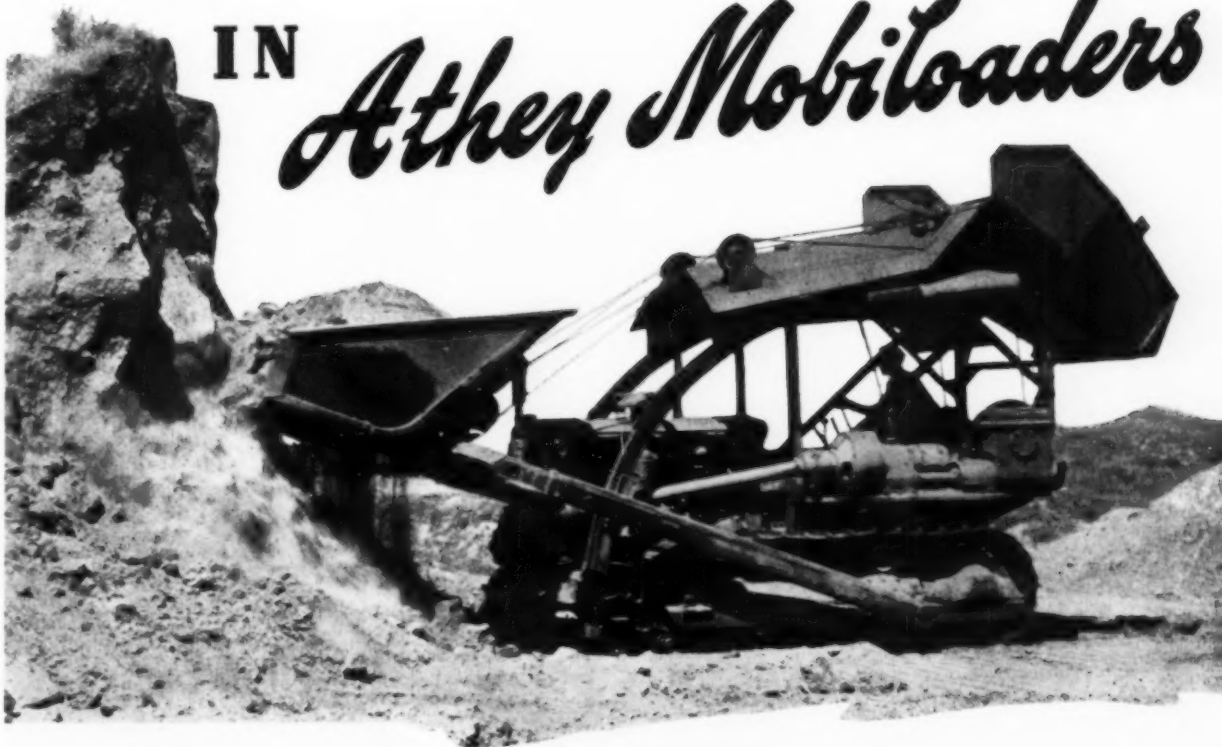
Protecting Band Rods

Purely as a protection to the circumferential steel bands, these rods are covered with a layer of concrete applied either by the shotcrete process or by placing in forms. In either case, the pro-

(Continued on page 128)

SPEED AND BIG CAPACITY

IN *Athey Mobiloaders*



Leveling airport runway in middle west.



Loading coral rock from stockpile in Florida.

There's the time-saving combination of speed and big capacity in the Model 8 Athey Mobiloader. It's the tractor loader that meets today's demands for greatly stepped-up wartime production. These speedy workers are widely versatile in their applications . . . they're serving successfully on a range of loading jobs that includes earth excavation, stockpile loading of sand, gravel and coal, iron ore and sugar beets.

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remember...

the Genuine
CROSBY CLIP
is easily and quickly applied
*no vise necessary
only one wrench*

write for illustrated brochure
"WITH AN EYE TO SAFETY"



(Continued from page 126)

tective concrete is a sand-cement grout. Wire mesh is incorporated in the protective coat for temperature reinforcement.

Methods of Construction

Construction operations will be described for the 60,000-bbl. tanks on the project already mentioned, to which most of the accompanying photographs refer.

Floor Slabs

Reinforced-concrete floors were designed 14 in. thick on a leveling fill of concrete. Rock overbreak resulting from the drilling and blasting made the average total depth of concrete in the tank floors about 20 in. At the outer edge of the slab, adjacent to the inner surface of the tank wall, the slab steps down 12 in. to form an annular shelf for the wall. The reinforced-concrete shelf, placed monolithically with the rest of the floor slab, has a minimum thickness of 12 in. on top of the concrete fill. To provide for the circumferential dropped shelf, the thickness of the slab increases by straight taper from a point about 6 ft. inside the shoulder to a depth of 30 in. at the shoulder. Provision is made at the shoulder for later pouring of an annular sealing joint between the shoulder and the concrete wall. This feature is made clear by an accompanying drawing.

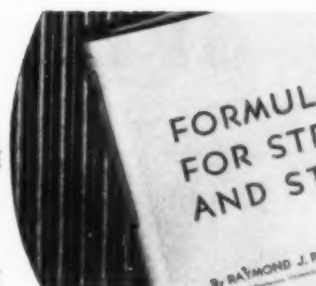
Concrete volumes required for tank floors ranged from 700 to 800 yd. per unit. Concrete for floors, as well as for the rest of the tanks, was mixed and delivered by 4-yd. truck-mixers. The truck-mixers discharged concrete for the floors directly into the hoppers of counterweighted chutes hung from the booms of two crawler cranes. Workmen in the hole moved the ends of flexible chute lines to deposit the concrete where required. Average progress in placing floor concrete was 120 to 125 yd. an hour. Best progress was made on one floor of 700 yd., completed at an average rate of 134 yd. per hr.

Wall Forms

An accompanying drawing shows the construction of the wall forms. The inner and outer surfaces of the walls were formed with framed plywood panels consisting of $\frac{5}{8}$ -in. plyform-grade plywood on 2x6-in. vertical studs and bandsawn horizontal plates of $1\frac{1}{4}$ -in. stock cut to the proper arc. Except for panels of odd size used at the base and top of the wall, all the form units were of 4x8-ft. dimensions. The form panels were good for an average of five uses; they were oiled each time.

Inner panels were erected with the long dimension vertical and with horizontal joints staggered. As the first step in wall construction, the forms for the inner surface were erected to full height and

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Among the more important tables of formulas are those

- for straight beams, circular rings and flat plates under a wide variety of conditions of loading and support;
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- for slender bars and thin plates in which failure occurs through elastic instability.

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braced to the interior centering to establish the plumb lines and position of the entire wall. Outer panels were placed with the long dimension horizontal and with vertical joints in line, successive lifts being added as concreting progressed.

Temperature Steel

After the inner wall forms had been erected and a working platform had been provided by placing the deck panels on the temporary interior centering, the steel crew installed two-way temperature reinforcement 2 in. inside the inner and outer surfaces of the wall.

Wall Concreting

Four alternate wall sections, each 46 ft. long by 1 ft. thick, were concreted in one day. For a 60,000-bbl. tank, the height of the wall from the shelf footing to the bottom of the thickened edge of the roof slab is 34 ft. 5 in. Four wall sections, requiring 230 yd. of concrete, were completed in 5½ to 6 hr.

Truck-mixed concrete was transferred by crane and bucket to a floor hopper on the deck forms. Hand carts distributed the concrete from the hopper to elephant-trunk tremie pipes which delivered the concrete into the wall forms by way of a remixing hopper. Concreting progressed in 4-ft. lifts on two sections at a time. The concrete crew filled a 4-ft. lift on two sections in about ½ hr. While this work was going on, the form crew lowered and erected panels for an additional 4-ft. lift on the two other sections.

Because of the large amount of temperature reinforcement in the concrete walls, vibrating of the concrete was difficult, and the concrete was spaded in place. All other concrete employed in construction of the tanks was vibrated internally with flexible-shaft vibrators, either air-powered or gasoline-powered.

Vertical Construction Joints

Plain butt joints were constructed between wall sections. Horizontal temperature reinforcement is continuous through the joints, but no flashing was installed. Because the concrete never will be under tension, opening of the construction joints is unlikely. As a precaution, a recess ¾ in. deep by 8 in. wide was formed in the inner surface of the wall to full height at each construction joint. The recess later was filled with iron-sand-cement grout of the same type used to seal the inner ring joint at the base of the wall, as will be described in another paragraph.

Concrete Columns

Inside the tank wall, the roof slab is supported by 32 circular reinforced-concrete columns of 20-in. diameter laid out on a rectangular pattern with equal spacing.

(Continued on page 130)



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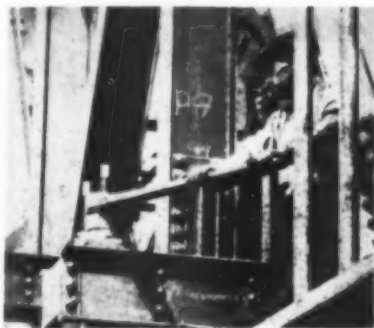
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(Continued from page 129)

ing in both directions. After the eight wall sections had been completed, the concrete crew for its next day's work concreted the 34 columns up to the elevation of the bottom of the drop panels of the flat-slab roof, placing 112 yd. of concrete in steel mold forms previously erected.

Roof Slab

Design load for the roof is based on a 225-lb. per sq. ft. live load plus 4 ft. of cover. The roof is a reinforced-concrete flat slab of 9-in. thickness, with 4-in.-deep drop panels and 4-in. thickening of the outer edge resting on the wall. The outer edge of the roof projects 4 in. beyond the wall, a distance equal to the thickness of the concrete incasement covering the prestressed band rods. While roof deck forms were being filled in around the edge for the thickened section on top of the wall, followed by oiling of deck forms and placing of roof steel, carpenters stripped the wall panels from the inner and outer surfaces of the wall. The ring of off-size wall panels at the top of the wall remained in place to support the deck forms. Each roof slab took 34 tons of reinforcing steel and 300 yd. of concrete.

Applying Band Rods

With concrete construction completed, the tank was ready for application of circumferential band rods. To take the load imposed by the liquid in a filled tank, band rods are distributed in accordance with the hydrostatic pressure, the greatest amount of steel being placed at the bottom. For 60,000-bbl. tanks with an inside clear height of 33 ft. 10 in. from the floor to the underside of the 9-in. flat-slab roof, a considerable weight of steel is required near the base of the wall.

Rods of large diameter, set at close spacing, would have been necessary if the steel had been applied in a single layer. To avoid the difficulties of obtaining the large rods and applying them at close spacing, the design for the 60,000-bbl. tanks called for two layers of band rods for a height of 13 ft. from the shelf footing. For the first layer of bands, 99 rods of 1 1/8-in. diameter were used from the bottom to the top. Starting at the base, the first 51 rods were set at uniform 3-in. spacing; from this point, the spacing of the rods increased in stepped increments to 12 in. at the top.

Each rod was made up of eight segments connected by turnbuckles. Turnbuckle connections were staggered in alternate rods, as indicated by photographs. Recesses previously had been formed in the outer surface of the concrete wall to provide space for the turnbuckles. Vertical wooden spacing bars,

(Continued on page 132)



A fire retardant coating material designed to reduce the fire hazard of interior building surfaces and other combustible materials. Protects against the intense, sustained fire.

It is highly adhesive, will bond to wood, wallboard, sheathing, wood fibre material and metal. May be applied over a painted surface, highly moisture resisting.

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TRAINING LESSON No. 1 FOR NEW 'DOZER OPERATORS



★ In making a cut, always watch your blade and keep it sufficiently full so you can see dirt over the top at all times. Handling this amount of dirt enables you to fill low spots ahead and insures a smooth cut.



★ Before starting a cut in uneven ground, "level off" a spot so the tractor will be level when you start cutting. Sometimes this can be done by dragging the blade backward over the spot to be levelled. Always travel slowly when levelling.

Practical Job Instruction Ideas Taken From Training Courses Originated and Conducted by LaPlant-Choate for Uncle Sam's Airborne Engineers

FIRST thing a new operator should do when he climbs on a 'dozer-equipped tractor is to practice raising and lowering the blade until he "feels at home" with the controls — and until he knows "second nature" which movement of the lever raises or lowers the blade. One of the most important points in operating a bulldozer or trailbuilder is to be able to inch the blade up or down slowly. This prevents digging holes and leaves a smooth, even surface over which the tractor can travel without nosing up and down like a roller coaster.

Always start the tractor in motion before lowering the blade to cutting position. Then take only the depth of cut you can handle without stalling the motor. Remember, a good 'dozer operator always judges his cut by the sound of the tractor motor. If it slows down too much, he knows he has "bitten off more than he can chew." Gradually raising the blade will relieve the motor.

★ Illustrated at left is the "jeep of the earth-moving industry" — a new pint-size LaPlant-Choate 'dozer developed especially for airborne operations.

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(Continued from page 130)

drilled at the proper intervals and fitted with long spikes which could be slipped in and out, facilitated the placing of rods at the desired locations as the rod segments were lowered and connected around the circumference of the tank. Accompanying photographs show the methods of lowering the rods, connecting them and tightening them to a snug fit.

Sealing Base Joint

After the first four rods had been installed at the bottom, they were stressed to one-half design load. Stressing of the four rods put the bottom of the concrete wall in compression to permit sealing the base joint between the wall and the shoulder of the floor slab. After the joint had been filled for 24 hr., the rods were tightened to full stress.

The base joint, 18 in. deep and $\frac{1}{2}$ to $\frac{3}{4}$ in. wide at the bottom, increases in width by a slight shoulder taper to the top. The original design called for a top width of 1 $\frac{1}{2}$ to 2 in., but the width was increased to 2 $\frac{1}{2}$ in. to make it possible to pull out the plywood panel forms by lifting with a chain ratchet hoist.

Two kinds of mortar were used in filling the joints. The lower 12 in. was filled with an ordinary 1:3 cement-sand mortar. In the upper 6 in., the joint was sealed with an iron dust mortar consisting of one part iron dust, two parts cement and three parts sand. This mortar has the property of expanding when setting.

Steel band rods used on the tanks have an elastic limit of 45,000 psi. The rods were prestressed to about 23,000 psi. to insure a residual compressive stress of about 200 psi. in the concrete when the tank was filled. Stressing of the band rods under the latter condition still would be safely within the elastic limit of the steel. The rods were prestressed in accordance with a calibrated procedure which took into account the temperature when the rods were first snugged up.

To indicate the application of the method, the prestressing of 1 $\frac{1}{8}$ -in. round rods, seven threads per inch, required the following number of turns per turnbuckle, depending on the temperature when the rods were snugged up. Temperatures are given in Fahrenheit, followed by the number of turns per turnbuckle: 60 deg., two turns; 40 deg., two and one-third; 20 deg., two and two-thirds; and zero degrees, three. Extensometer tests of rods prestressed by the calibrated procedure have demonstrated the superiority of this method.

In prestressing a rod, two diametrically opposite turnbuckles were tightened at a time, and the portions of the rods between the two turnbuckles were tapped lightly with a hammer to prevent bind-

(Continued on page 134)



FRICTION *also wears out motors!*

A pair of pants is not as hard to replace as vital motor parts—but in either case, you're more interested in protection than in replacement. Macmillan RING-FREE Motor Oil *protects* pistons... rings... valves... bearings because it reduces friction faster!

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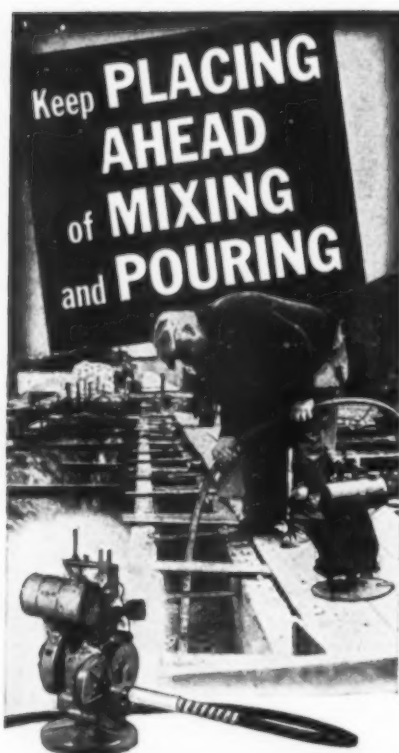
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on suitable priority.

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Chicago 19, Illinois

(Continued from page 132)

ing. A special lever bar made up by the job blacksmith facilitated the tightening of turnbuckles.

Incasement of Rods

To protect the band rods, a concrete incasement 4 in. thick of sand-cement grout (reinforced with wire mesh against temperature cracks) was placed over them. Exterior panel forms tied to form ties previously embedded in the wall were employed in placing the protective grout. Job calculations indicated that this protection would be only about half as expensive as an equal thickness of shotcrete, and actual costs bore out the expectations.

Additional steel was applied at the base of the tank by applying 30 rods (13 of 1½-in. diameter and 17 of ¾-in.) at designed spacing to a height about 13 ft. above the footing. These rods were prestressed in the same manner as previously described and were incased in 4 in. of sand-cement concrete.

Design of Mix

Concrete for the tanks was designed in accordance with the Navy's Class G-1 specification, with 8.1 sacks of cement per cu. yd. and a maximum water content of 5 gal. per sack, producing a slump of about 5½ in. Rich concrete was needed not for strength but for impermeability. Most cylinders tested 5,500 to 6,000 psi. compressive strength at 28 days, exceeding the specified requirement of 4,000 lb. Coarse aggregate was of 1½-in. maximum size.

On peak days the job employed 23 4-yd. truck-mixers, delivering concrete to as many as three or four points at one time. A batching plant of 2-yd. capacity, set up to serve the project, charged two batches into each truck-mixer. The fuel storage tanks were distributed in two areas, one at an average distance of ½ mi. from the plant, and the other at a distance of 2 mi. Concrete construction was going forward simultaneously in the two areas.

Pumping and Heating Shaft

Considerable groundwater is present in the tank areas, and a drainage system had to be provided for each unit to eliminate danger of the tanks' floating when empty. Floor slabs were designed to resist a hydrostatic head of 6 ft., with a safety factor of 2½. An empty tank becomes buoyant with 18 ft. of water outside.

At the edge of the footing surrounding each tank is a 12-in. concrete pipe drain laid in sand-gravel and backfilled with gravel. This pipe leads to a sump at the base of a pumping and heating shaft constructed in connection with each tank. Steam lines for heating the stored fuel enter the tank through this shaft. A

(Continued on page 136)

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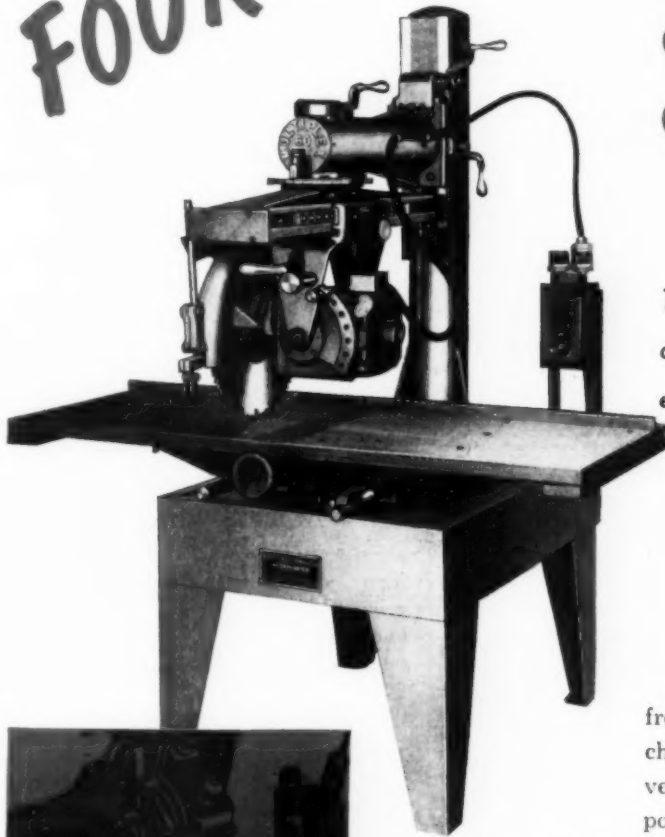
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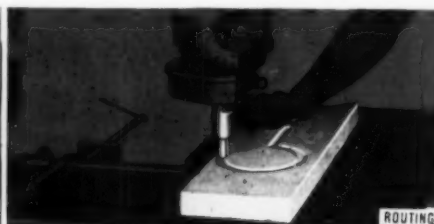
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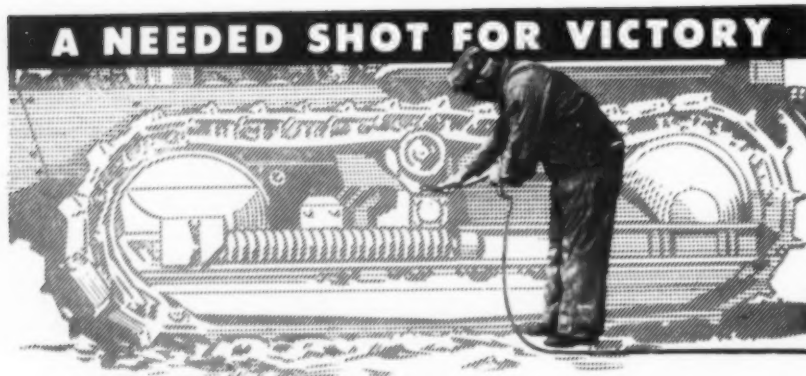
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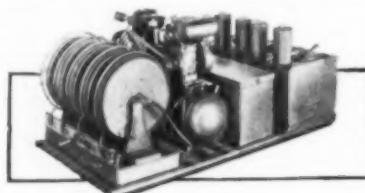
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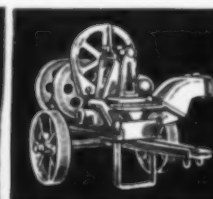
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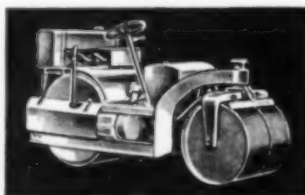
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MANUFACTURING COMPANY

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(Continued from page 134)

float-operated electric pump discharges excess water from the sump. To prevent flooding of the shaft in case of power failure, the inlet pipe from the drainage system into the sump is equipped with a float-controlled valve.

Excavation

To reduce the quantity of excavation and simplify the disposal of spoil, grades in the two tank areas were adjusted to put the roof decks of the tanks at roughly the elevation of the original ground surface and to cover the entire areas with 3 ft. of fill obtained from the spoil banks. Topsoil was stripped first by bulldozers and was stored in separate piles to provide a 4-in. surface for vegetation on top of the fill material.

Power shovels and trucks moved the remainder of the earth overburden and all of the blasted rock from the tank excavations into the spoil banks. Trucks operated up a ramp out of each hole. Shale excavation averaging 20,000 yd. per tank was the principal item of excavation.

Rock excavation was expedited by drilling blast holes with wagon drills from the surface of the shale to the sub-grade of the floor slab, a maximum depth of 26 ft. The contractor operated six or seven wagon drills supplied with air from two large portable compressors hooked up in tandem. Holes spaced 7 or 8 ft. apart were drilled with detachable bits and were loaded to full depth with 40 percent gelatin dynamite. At the location which required rock excavation to the maximum depth of 26 ft., the blasting charge totaled 4 tons. Rock breakage averaged 2½ yd. per pound of explosive.

Blasted rock was loaded into trucks by 3- or 2-yd. shovels; excavators of the latter size sometimes worked in pairs in one hole. After the shovels had removed the loose rock, additional drilling with jackhammers, followed by blasting and final chipping with pneumatic paving breakers, ordinarily was necessary to level the bottom. Full-depth drilling and blasting resulted in bad bottom breaks in only two of the 28 tank locations.

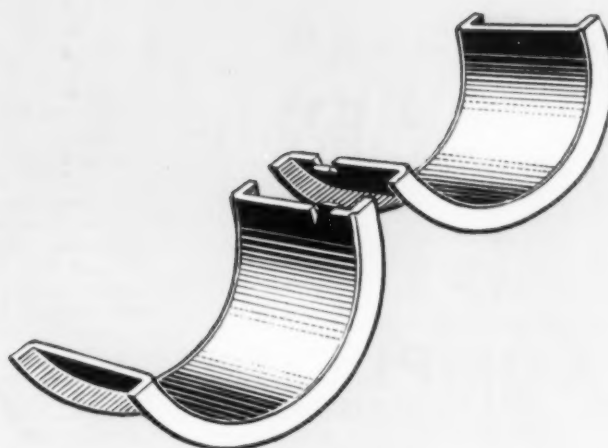
Direction

Prestressed concrete tank designs developed by the Bureau of Yards and Docks of the Navy Department are based on original work in this type of structure by William S. Hewett. Use of such tanks is in no sense experimental, as a number have been built in the last 20 years for storage of water, petroleum products and other liquids.

Prestressed concrete tanks described in these notes were designed by the Navy's Bureau of Yards and Docks, of which Rear Admiral Ben Moreell is chief. Construction was by private contractors, with supervision by local public works officers for the Navy.

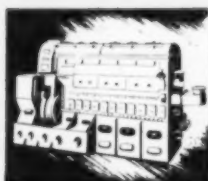


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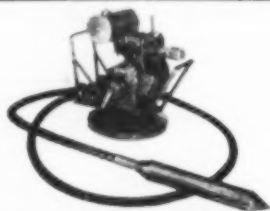
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Dixie Cup Co.	98	Shell Oil Co.	137
Duff-Norton Mfg. Co.	120	Sinclair Refining Co.	39
		Skilsaw, Inc.	123
Electric Tamper & Equip. Co.	86	Socony-Vacuum Oil Co.	25
Ensign-Bickford Co.	100	Sonneborn Sons, Inc., L.	106
Euclid Road Machy. Co.	7	Sonoco Products Co.	82
		Standard Oil Co. of Calif.	34
Foot Co., Inc.	27	Sterling Machinery Corp.	115, 138
		Sterling Wheelbarrow Co.	90
Galion Iron Works & Mfg. Co.	125		
Gar Wood Industries, Inc.	38	Templeton, Kenly & Co.	100
General Excavator Co.	20	Texas Company, The	8, 9
General Motors Corp.		Thew Shovel Co.	35
Electro-Motive Div.	26	Timber Engineering Co.	85
Truck Div.	84	Timken-Detroit Axle Co.	109
Goodrich Co., B. F.	10	Timken Roller Bearing Co.	4th Cover
Goodyear Tire & Rubber Co.	48		
Gorman-Rupp Co.	102	Union Fork & Hoe Co.	90
Gray Co., Inc.	136	Union Iron Works, Inc.	118
Griffin Wellpoint Corp.	106	Union Metal Mfg. Co.	37
Gulf Refining Co.	89	Union Wire Rope Corp.	12
Gustin-Bacon Mfg. Co.	Insert bet. 92 & 93	Universal Engineering Corp.	40
		Universal Form Clamp Co.	116
Haiss Mfg. Co., Geo.	102	Universal Road Mach'y Co.	110
Hazard Wire Rope Division,			
American Chain & Cable Co.	29	Vulcan Iron Works	106
Heil Company, The	21		
Hercules Co., The	20	Wellman Co., S. K.	44
Hetherington & Berner, Inc.	92	Wellman Engineering Co.	132
		White Mfg. Co.	138
Independent Pneumatic Tool Co.	45	Whiteman Mfg. Co.	114
Inland Steel Co.	2nd Cover	Wickwire Spencer Steel Co.	95
Jaeger Machine Co.	33		

THE U.S.S. OKLAHOMA IS RIGHT SIDE UP



AMERICAN CABLE **TRU-LAY** PREFORMED WIRE ROPE DID THE PULLING



Official U. S. Navy photograph

Pearl Harbor, Hawaii. Even Date—The 29,000 ton U.S.S. "Oklahoma" is again afloat. During months of preparation by the Pacific Bridge Company, some 50 miles of **TRU-LAY** Preformed and **CRESCENT** Non-Preformed wire rope (ranging in diameter from 1" to 3") was shackled to the huge ship, then in less than 69 hours operating time the "battlegon" was pulled out of her list of 151 degrees back to within 10 1/2 degrees of natural position.

For this spectacular job, a sling or bridle was put over the ship. This bridle was made of 42 lengths (averaging 360') of 3" **CRESCENT** Non-Preformed rope. Attached to this were 21 reels (10,000' each) of 1" **TRU-LAY** Preformed wire rope. These were attached to winches ashore, and after less than three days steady pulling, the "Oklahoma" was right side up.

The American Cable Division, not only for this shining example but for its less spectacular day-in and day-out effort, is proud to be numbered among those who are working to speed the war's victorious end.

AMERICAN CABLE DIVISION Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Portland, Tacoma
AMERICAN CHAIN & CABLE COMPANY, INC.
 BRIDGEPORT, CONNECTICUT



ESSENTIAL PRODUCTS . . . **TRU-LAY** Aircraft, Automotive, and Industrial Controls, **TRU-LOC** Aircraft Terminals, **AMERICAN CABLE** Wire Rope, **TRU-STOP** Brakes, **AMERICAN** Chain, **WEED** Tire Chains, **ACCO** Malleable Castings, **CAMPBELL** Cutting Machines, **FORD** Hoists, Trolleys, **HAZARD** Wire Rope, Yacht Rigging, **MANLEY** Auto Service Equipment, **OWEN** Springs, **PAGE** Fence, Shaped Wire, Welding Wire, **READING-PRATT & CADY** Valves, **READING** Electric Steel Castings, **WRIGHT** Hoists, Cranes, Presses . . . *In Business for Your Safety*

**Faster Construction at lower
cost with more Timken Bearings
in your machines**

Every additional Timken Tapered Roller Bearing that goes into a construction machine adds that much more to its efficiency and economy. With Timken Bearings at every suitable position you get the utmost in friction reduction and load protection plus correct and constant alignment of moving parts—thus speedier operation; greater endurance; lower maintenance.

The Thew Shovel Company, one of whose Moto-Cranes is shown working on the construction of an important airfield, has been Timken Bearing conscious for years—and the performance of Thew equipment shows it.

In the Moto-Crane Timken Bearings are used in the Center Drive and swing shaft mechanisms and also at various points in the chassis unit, including front and rear axles and steering gear. The Timken Roller Bearing Company, Canton, Ohio.

**Don't wait
to see what will hap-
pen after Victory; get
ready for anything with
redesigned equipment
using Timken Bear-
ings throughout.**

TIMKEN
TAPERED ROLLER BEARINGS

